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The Cheltenham Conference

There are many features of a commendable character to be associated with the holding of a technical conference in a non-industrial centre such as Cheltenham Spa. Outstanding is the fuller participation by the members, because of the absence of the need for the " home team " to catch the last train or 'bus or to put in a morning at the works or office. In short, the location of the conference placed the hosts—the Bristol and West of England Branch—in much the same position as their guests. The 46th Annual Conference of the Institute attracted a record attendance for any provincial meeting, it being of the order of 480. From this it can be deduced that the programme of technical papers, works visits and social events were well balanced and attractive. Consummate skill in organising by the head office staff was a source of gratification to the members and their ladies.

The Institute of British Foundrymen has been in recent times exceedingly fortunate in the choice of its officers, for they are personalities who both know what to say and how to say it. Particularly does this apply to the outgoing president, Mr. R. B. Templeton and the newly-elected one, Mr. Noel Newman, whose presidential address, spiced with wit, disclosed the " know how " for the creation of a " happy shop "—a prime requisite for ordered progress. We have used the American expression " know-how " because, after being privileged to visit his works, there was ample confirmation that his message was not just abstract wishful thinking. The value of the E. J. Fox medal was enhanced by its award to Sir Andrew McCance, for the recipient has an international reputation as a scientist who has clarified the mechanism of slag reactions to the great benefit of the metallurgical industries. Applied technology at its best was recognised by the award to Mr. G. L. Harbach of the " Oliver Stubbs," and foundry technique also at its best by the granting to Mr. D. H. Young of the British Foundry Medal.

There was nothing of a revolutionary character disclosed, either by the technical papers or the reports submitted, but they faithfully mirrored the good solid work that is being achieved. New ground was broken by a Report of the Technical Committee of the Association of Bronze and Brass Founders, as it is the first occasion upon which a manufacturer's association has mobilised its great and unique technical resources, and placed its findings to industry through the Institute. This indeed is both desirable and useful co-operation. Mr. Waeles, the Author of the French Exchange Paper on training for the foundry industry, was especially welcomed, as he disclosed both accomplishment and aspirations. Perhaps the most important lesson to be drawn from it was stressed by Dr. Pearce, who underlined the great potential strength of French foundry technology, compared with our effort, based on statistical analysis of the output of graduates from *l'Ecole Superieure de Fonderie* over long years as compared with our National Foundry College and its forerunner. Though the British Foundry industry is so much larger than the French, yet the supply of qualified technicians is, lamentably, in the inverse ratio. This situation must and can be remedied through its recognition by enlightened foundry owners.

Mr. Newman and the officers and members of the " Bristol " Branch have well merited the thanks of those participating in the Cheltenham conference. Appreciation must also be accorded in full measure for the visits to the firms they represented, for the foundries of the West of England possess many features of interest worthy of general emulation. The social functions were particularly

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The Cheltenham Conference

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appreciated, especially the visit to the Stratford-on-Avon Theatre. The fact that so few had studied or even read "Cymbeline," gave rise to doubts as to its entertainment value. The excellence of production and superlative acting quickly removed this doubt, and the show deserved and received enthusiastic approbation. Perhaps, we do not know, "Cymbeline" much resembled the whole Cheltenham conference, except of course, the latter was strictly moral!

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

HIGH-DUTY CAST IRON

To the Editor of THE FOUNDRY TRADE JOURNAL

SIR,—I am sure that many of your readers must share my regret that Mr. Campion's reply (*F.T.J.*, June 9) to my letter of May 26, completely ignores my criticism of his use, in a technical paper, of information which apparently cannot be supported by experimental data.—Yours, etc.,

ARTHUR B. EVEREST.

The Mond Nickel Company, Limited,
Sunderland House,
Curzon Street, London, W.1.

ON JUNE 16, a party of some 150 members of the Midland Branch of the Institution of Mechanical Engineers paid a visit to the Rugby Works of the British Thomson-Houston Company. The visitors divided into small parties and were taken round various departments engaged on the manufacture of the heavier types of electrical plant and equipment, including the foundry.

examination standards, which, he said, were too hard, there being only 20 per cent. successful Licentiates and 33 per cent. Associates. This view was not shared by other members at the meeting, and Dr. Jenkins explained the system which was followed in drawing up the syllabus. Mr. A. Dunlop raised the question of opening branch offices in Birmingham and this was referred to the Council. On the question of examination results, "pass" or "fail," it was suggested that these should be further considered by the Council in the light of the candidate's industrial experience. Discussing the recognised technical scientific exhibitions in the national museums, the opinion that these were not abreast of the times was expressed and the Council was asked to examine ways in which the Institution could help to rectify this deficiency.

The formal proceedings were followed by a buffet tea and conversazione, at which group discussions were continued.

Institution of Metallurgists

Annual General Meeting

The Annual General Meeting of the Institution of Metallurgists was held on June 16 at 4, Grosvenor Gardens, London, S.W.1. Following upon the reading of the Report of Council, the Statement of Accounts and the Secretary's Report, the Hon. Auditors were re-elected, and the following officers were also elected:—As *President*, Maurice Cook, D.Sc., Ph.D. (Imperial Chemical Industries); as *Vice-Presidents*, Mr. W. E. Ballard, F.R.I.C. (Metallisation, Limited), and Prof. Hugh O'Neill, D.Sc., M.Met. (University College, Swansea); as *Honorary Treasurer*, Dr. C. J. Smithells (British Aluminium Company); as *Members of Council*, Mr. W. A. Baker, B.Sc. (British Non-ferrous Metals Research Association) and Mr. W. Barr, A.R.T.C. (Colvilles, Limited), representing the Fellows, and Mr. T. Dennison, B.Sc. (B.I.S.R.A.) and Mr. W. J. B. Smith (Ministry of Supply), representing the Associates. The Iron and Steel Institute's nomination to Council, Dr. H. A. Dickie (Stewarts and Lloyds), was approved.

Presidential Address

After his election to the chair for this (his second) year, the President delivered his Address, in the course of which he thanked the officers of the Institution for their help and co-operation over the past year. Membership, he continued, had increased during the year by 193 to 1,894, and, whilst this figure was gratifying, it left no room for complacency because there were hundreds more metallurgists who could gain from membership. He then dwelt briefly on the position of overseas members, and stressed the vital importance of the world acceptance of the examination standards and general qualifications of those admitted to membership of the Institution. National Certificates in Metallurgy for Scotland were this year being arranged on the same basis as already existing in England and, in the present year, there were 18 candidates from Scotland. Deferment of National Service liability had been agreed under certain circumstances by the Ministry of Labour and National Service for *bona-fide* candidates for the Licentiateship of the Institution.

The President then went on to outline the services which had been provided for members during the year. The refresher courses (another was to be held at Ashorne Hill from September 16 to 18), were very successful. He concluded with the announcement of an event calculated to interest the general public in metallurgy—the holding of an exhibition entitled "Metals in the Service of Mankind," organised by the Institution, to be housed in the Science Museum, South Kensington, and open from July to September next year.

Discussion

After the President's speech there was considerable general discussion on a variety of topics which, nevertheless, centred mainly on finance and the need for augmenting revenue by attracting new members or by other means. Mr. G. Meikle was critical of the present

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Institute of British Foundrymen

Forty-sixth Annual Conference, Cheltenham Spa

Annual General Meeting

The 46th Annual Conference of the Institute of British Foundrymen was held at Cheltenham Spa from June 14 to June 17, 1949. At the opening session on Tuesday, June 14, delegates were received by the Mayor of Cheltenham and the Mayoress in the Old Town Hall. A concert and entertainment followed.

The official welcome and opening of the Conference took place on Wednesday morning, June 15, in the Pillar Hall, Town Hall, Oriel Road, Cheltenham, when the Mayor, Alderman P. T. Smith, officially welcomed the delegates to the town.

The chair was taken by the President of the Institute, Mr. R. B. Templeton, who, opening the meeting, said he was sure the pleasure they felt in being there was something they would remember for a time long after they had returned to those less pleasant settings where they spent many hours toiling to produce castings over the design of which they had little control, rejoicing when they achieved their objective and sorrowing over the meagre reward they received in return.

If the Mayor could spare the time to attend any of their meetings, he might be surprised at the strange terms they used and the mystic practices in which they seemed to indulge. He himself would not be surprised if the Mayor did not understand those things because, although he had risen to the height of becoming President of the Institute, there were many occasions when those terms and practices were quite incomprehensible to him. The Mayor would, he trusted, find the Institute a kindly and friendly body who appreciated the hospitality which was being extended to them during their Conference meetings. Would the Mayor do them the honour of opening their 46th Annual General Meeting?

Civic Welcome

Responding to the invitation, the Mayor thanked the President for his kindly introduction and said he had had the impression of their friendliness on the previous evening. Everyone had been most kind, particularly their secretary, Mr. Makemson, whom he was afraid he had put to a lot of trouble. But he had done it all with such a nice spirit and such extraordinary courtesy and did his best to make him (the Mayor) understand. He even sent him a tome about the technicalities of the Institute, but he had not been able to get very far with it and, frankly, he had not even been able to understand the illustrations.

Not the least engaging of his official duties was the opportunity afforded of welcoming to the town delegates to the Conference of the Institute of British Foundrymen. They had chosen to discuss their varied problems in a restful, congenial atmosphere, in surroundings which he was happy to think were unique in the British Isles. Cheltenham was part and parcel of that older and more sedate England—the England of Regency days, the days of craftsmanship, the days when craftsmanship was assessed at its true value and when man built and planned with a taste and regard for human amenities that had never been equalled before or since. For their part they gloried in the past, although they were far from being antediluvian. He did not want to give them that impression. They realised that the world marched on and they realised also that ideas changed and tastes altered and so, notwithstanding its delightful Regency setting, Cheltenham was go-ahead and very much abreast of the times.

That he supposed was the magnet which had attracted their Conference to that proud and lovely town. He might be biased but he could not picture a successful conference in an atmosphere of swings and roundabouts. He could not imagine delegates giving their best after a surfeit of Shoot the Chute. Everyone, of course, to his taste. It would be a sad world if everyone was moulded into a pattern of dull uniformity. So he would assure them that their choice of Cheltenham as the venue of their deliberations was a matter of particular pride and satisfaction to the town. They would have an opportunity of becoming acquainted with that garden town of England and would, he was sure, realise its quiet charm, its happy situation and its restfulness, which played no small part in its individual appeal.

Cheltenham was, in other words, a bit of Old England, but not by any means a museum piece. It was beautifully preserved and it was up to the minute in its amenities and its awareness of this progressive post-war period. It was with infinite regret that he had to confess to little first-hand acquaintance with the Institute of British Foundrymen, but they would not expect him to trespass upon their special preserves by attempting to embark upon technicalities. As a lay man he did realise the utter dependence of modern civilisation on iron and steel. He knew full well that there was scarcely a human need in which that vital material did not play a major role.

He knew the important part they had played in the war period, but with the war years behind them he was confident that their great technical and scientific Institute, with its research development, would prove more than equal to the task confronting the country in its efforts to regain commercial supremacy. More power to their individual elbows! Might their Institute

Annual Conference, Cheltenham Spa

henceforth operate in the great services of peace! Might it play, as he knew it would, a major part in re-instating our mighty industrial nation on the commercial map of the world!

Cheltenham was theirs to command. They had the freedom of the town. They would meet with courtesy and goodwill wherever they went. He hoped its scenic beauties, its amenities and, above all, its peace and serenity would make their visit a very happy and memorable one. It was his sincere hope that, when in due course their tasks were ended, it would just be *au revoir* and that, all being well, the pleasure of welcoming them both as a Conference and as individuals would again be Cheltenham's happy privilege.

The PRESIDENT, returning thanks, said it was perfectly true that pleasant surroundings acted as a spur to effort. He did not think they could enjoy more pleasant facilities for their deliberations than in Cheltenham. He then proposed a vote of thanks to the Mayor for his welcome.

MR. N. P. NEWMAN, Senior Vice-President, who seconded, said he was a West Countryman and, so far as he was concerned, Cheltenham needed no advertisement. He was very fond of Cheltenham and that was one of the reasons why they were there that day. He thanked the Mayor and Corporation for the help they had given in arranging the Conference and to them and their officials he expressed the Institute's very great respect and thanks. He would have a further opportunity that evening of touching on that matter, so he would close by formally seconding the President's vote of thanks.

Annual General Meeting

The Annual General Meeting followed immediately, with Mr. R. B. Templeton in the chair. On the proposition of Dr. A. B. Everest, seconded by Mr. A. S. Wall, the minutes of the Annual General Meeting held in London on June 9, 1948, were taken as read, adopted and signed.

Presenting the Annual Report of the Council for the Session 1948-49 and proposing its adoption, the PRESIDENT said he would make only a brief reference to the Report, because it displayed adequately all that had been done—or perhaps left undone—during the year in which he had had the honour of being President. The Institute was moving, perhaps slowly, but moving it was, with ever-increasing influence on the minds of all those who comprised its membership, a membership which was growing year by year, in numbers, knowledge and skill.

The honours conferred on their members had been meagre perhaps in number and quality, but they must be thankful even for such small mercies. Their Charter and Bye-laws had been consolidated and would raise their whole status, a matter of great satisfaction to them all.

He had not managed to visit quite all the Branches and Sections during his year of office, but he had had the pleasure of visiting most of them and had been much impressed by the attendance at the meetings and the splendid organisation which existed. The hospitality and friendliness he had received wherever he had been would be something he would remember always. He could not help remembering and quoting at that stage a verse of Kipling:—

> "It 'aint the individual,
> Nor the army as a whole;
> It's the everlasting team-work—
> Of every blooming soul."

Of their technical development and education, he proceeded, one could not speak too highly. One of the events which interested him most was the Training Course for Foremen. That was a memorable example of the additional work that was being done, and it should be of lasting value to all who had taken part. It should not be forgotten that those facilities were now made possible by the grant of the Joint Iron Council, something which had been brought about by the efforts of their Past-President, Mr. P. H. Wilson.

Of the financial position, he would say little, but would leave that matter to the speculative optimism of their Hon. Treasurer, Mr. C. W. Bigg.

The international contacts of the Institute were improving and their relations with other organisations continued to be friendly. Of the Technical Council and its great work and achievement, Mr. L. W. Bolton would deal in a few moments. (The President explained that Mr. A. E. Peace, the Chairman, was unable to be present because of illness.) MR. TEMPLETON then formally moved the adoption of the Annual Report.

MR. P. H. WILSON seconded and the proposition was unanimously agreed to.

The Treasurer's Report

Presenting the balance sheet as at December 31, 1948, and the statement of accounts for the year ended December 31, 1948, and proposing their adoption, MR. C. W. BIGG, Hon. Treasurer and Past-President, said that two terms had rather impinged that morning upon his mind. One was "incomprehensible" and the other was "speculative optimism." He was going to have nothing to do with speculative optimism and he hoped he was going to keep equally free from incomprehensibility. He thought the accounts needed very little comment from himself. There was very little difference between the expenditure and the income in connection with the ordinary side of their accounts. He was glad to say that the little difference there was was in the nature of a surplus balance and that there was not a gap. The balance sheet had changed very little.

That year, for the first time, they had had the advantage of a grant from the industry, and he felt that he might congratulate the industry on at last shouldering some little responsibility for something from which they had been the major beneficiaries. He thought it was desirable that the industry should see what the Institute did and that their members should realise that, although they showed a balance on their ordinary accounts, that did not reflect the effect of their whole expenditure. They now needed to budget on a five-figure basis, and he would go so far as to repeat a remark he made at the Council the previous day when they had discovered that the Institute of British Foundry-

men was following a wider example and were subsidising a large part of their membership. They could not do much about it at the moment, but he asked them to bear it in mind.

Mr. S. H. Russell, seconding, said that, as a past-treasurer, he was somewhat concerned to see what a small surplus they were able to carry forward, bearing in mind that the Technical and Educational Fund had to provide £450 for salaries and administrative purposes, and without that they would not have paid their way. He referred to the fact that other technical bodies were having to increase their subscriptions and said that the present financial position of the Institute was causing the Council some anxiety owing to the difficult years that might lie ahead. On the other hand, they could take comfort from the fact that there was some £7,000 in the Accumulative Fund which they might find helpful. The accounts, when put to the meeting, were carried unanimously.

Technical Report

The Annual Report of the Technical Council, the next item on the agenda, was submitted by Mr. L. W. Bolton, in the absence through illness of Mr. A. E. Peace, the Chairman.

MR. BOLTON said they would have seen from the Seventeenth Annual Report of the Council that the past year had been one of high endeavour and great activity, and the number of meetings of the committees and sub-committees had been a record. Thanks were due to those firms which had allowed their members to attend those meetings and carry out experimental work during their hours of work. They had also benefited by the grant provided by the industry through the Joint Iron Council, and that had enabled them to enlarge the work of several of their sub-committees and to allow for the sanction of expenditure on laboratory work and increased clerical assistance. Several new sub-committees had been formed during the year and others had finished their work.

"The Atlas of Defects in Castings," which was published several years ago and for which there had been a steady demand, had been revised and much enlarged. In that connection they wished to thank the Technical and Research organisation of the British Steel Founders' Association for their co-operation and assistance in providing information for the preparation of a section on defects in steel castings. That revised atlas would be made available to members very shortly.

To ironfounders he would specially commend two reports completed by sub-committees during the year which were being presented to the Conference, the report of T.S.18 on the effect of stripping at high temperature and that of T.S.27, under the chairmanship of Mr. W. W. Braidwood, on Cupola Raw Materials. Both those reports they would find to contain a great deal of useful information.

DR. A. B. EVEREST, supporting the adoption of the Report of the Technical Council, said that in the Technical Council they had an organisation which was unique among the technical bodies of the country. It was worthwhile remembering that all that large amount of work was done on a voluntary basis, and he did not think any other similar organisation could show anything to equal their activity. It was a matter of gratification and pride to them all that so much work was being done. The success of the Technical Council was dependent on the excellent leadership that they had.

He paid a tribute to the work of Mr. Peace and Mr. Bolton, who had followed in the tradition of excellent leadership set by their predecessors, Mr. Gardom and Mr. Philip Russell. He also thanked the Secretary and his office staff for the help they had given during the past year.

The PRESIDENT, putting the motion to the meeting, described the work done by the Technical Council as great and unselfish, and he included also that of the members of the various sub-committees. The Annual Report of the Technical Council was then formally adopted, and, on the suggestion of the President, it was agreed that a telegram of good wishes should be sent to Mr. Peace expressing the hope for his speedy recovery.

Presentation of Awards

The presentation of the *Oliver Stubbs Medal* for 1949 was made to Mr. G. L. Harbach.

Making the presentation, the PRESIDENT said he knew of no one who was more entitled to receive that recognition for distinguished service to their Institute. If they looked through the list of members who had served on the various committees in the past and the present, they would find Mr. Harbach's name in most of them. He was a shining example of one who put into the Institute more than he could ever hope to get from it, except perhaps the pleasure he received in doing everything in his power to further and improve the knowledge and technical skill of others. His record was a fine one and he richly deserved that token of their appreciation.

MR. HARBACH said that, while deeply appreciative of the honour bestowed upon him, he was very conscious of the fact that the work that had gone towards his receiving that award was by no means a solo effort. Thanks were due to many people, particularly to his firm. Mr. Bolton had mentioned a few minutes ago that the Technical Committees relied on the facilities given to members by their firms to carry on research work and attend meetings. He had been particularly fortunate in that respect. Without the co-operation of his staff and colleagues in the works to carry out the work, on which he, to some extent, had acted as a reporter, success would not have been achieved, and he took that opportunity of thanking them personally. He also thanked his wife for her patience at his unpunctual attendance at meal times and on other occasions when he had been deeply engrossed in some scientific Paper.

Th presentation of the *E. J. Fox Medal and Parchment* was made to Sir Andrew McCance.

Making the presentation, the PRESIDENT said the award was given to Sir Andrew in recognition of his contribution to the steelfoundry industry and it was, he thought, well merited. Five axioms were laid down in their bye-laws to govern that award, and they set up high standards. There was not, however, one of the five which Sir Andrew could not pass with flying colours. His record as a scientist and industrialist was, indeed, a great one.

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SIR ANDREW MCCANCE, replying, said Mr. Fox had introduced into the foundry industry a new technique. He first became associated with the foundry industry in 1919, when he had the temerity to start a new steel-foundry, and he then became very much interested in some of the problems associated with foundry technique.

The 1949 *Meritorious Services Medal* was awarded to Mr. Arthur Sutcliffe, who was unable to accept it in person because of ill-health.

The PRESIDENT said it was with mixed feelings that he announced that award to Mr. Sutcliffe, of the Lancashire Branch, because Mr. Sutcliffe was too ill to attend to receive it. He therefore asked Mr. R. L. Handley, President of the Lancashire Branch, to accept the medal for him and he gave it to him with their hopes for Mr. Sutcliffe's speedy recovery. The President also asked the Secretary to send a telegram conveying the good wishes of the Conference to Mr. Sutcliffe.

MR. HANDLEY, replying, said the honour conferred on Mr. Sutcliffe gave very great satisfaction to the Lancashire Branch, of which he was a most popular member. He was also one of their most active members. He knew that that award would please Mr. Sutcliffe as much as it pleased them all that he had been chosen to be the recipient of it.

The PRESIDENT announced that the 1949 *British Foundry Medal and Prize* had been awarded to Mr. D. H. Young, Past-President of the Scottish Branch, for his Paper on "The Manufacture of Some Large Castings for Marine Engineering," and he asked Mr. Barrington Hooper to present the medal.

MR. YOUNG, replying, said it had been for him a labour of love and, if they did not find joy in their daily work, what chance was there of their becoming a contented people? Foundrymen, he added, were creators and, when all was said and done, the daily task well done was the one real social service that was worth while.

The SECRETARY (Mr. T. Makemson), having been called on by the President, then announced the awards of Diplomas for 1949, given for Papers read before the various branches. They were: Mr. J. F. Barnes and Mr. F. E. Ironmonger for their Paper on "Making a Large Eight-cylinder Diesel-engine Crankcase"; Mr. C. R. Van der Ben and Mr. H. Haynes on "Production of Iron Castings"; Mr. A. R. Wizzard on "Art Foundry Practice," and to Mr. J. H. Williams on "Casting Inspection."

Honorary Life Member

Asking the delegates to elect Mr. V. C. Faulkner as an Honorary Life Member of the Institute, the PRESIDENT said he had had many pleasant tasks to perform, but none was more pleasant than the present one. There was nothing more about Mr. Faulkner that he could say than they already knew. They all knew his record and he doubted if anyone living had done more for the Institute than he. He could, however, say of him that, if any of them should at any time want advice or help in any difficulty, their thoughts automatically turned to him, and he knew of no finer compliment he could pay to anyone or one which was more richly deserved. In electing Mr. V. C. Faulkner as an honorary life member, he felt they would be doing an honour both to the Institute and to themselves.

MR. FAULKNER, responding, said he was pleased that honour had been bestowed in a manner appropriate to its importance, for records of the past revealed that no ceremony had accompanied the award. When he first joined the British Foundrymen's Association, some 41 years ago, there were 29 honorary members, and they achieved that dignity by the annual payment of one guinea. They were subsequently de-graded to ordinary membership in 1909 at a meeting in Birmingham under the presidency of the late Mr. Fred Cook.

It would ill become him were he not to acknowledge that his work for the Institute had only been made possible by the facilities accorded him by the proprietors of the JOURNAL, Mr. Harold Jeans and Mr. Barrington Hooper, by the enthusiastic assistance of his staff, especially Mr. John Butler, Mr. John Bolton and, more recently, Mr. Reg. Parkes, and the co-operation he had invariably received from the permanent staff of the Institute and the Council of its London Branch.

He had derived an infinite amount of pleasure from his long association with the Institute and valued most highly the innumerable friendships that the decades of members had invariably accorded him.

Election of Officers

Proposing the election of Mr. N. P. Newman as President for the coming year, MR. TEMPLETON said his career in their industry had been meteoric. A few years ago they might have said "Who is Mr. Newman?" Today they said "Who is not Mr. Newman?" In one way he felt sorry about that, because he had hoped to raise a feeling of sympathy in their hearts by enlarging on the strenuous time and the hard work that had fallen to his own lot during his year of office. However, he could not now do so, because Mr. Newman was not only taking on this work as President, but was also doing other and perhaps more difficult and responsible work as President of the Council of Ironfoundry Associations, President of the National Ironfounding Employers' Federation, as well as, in the spare time now possible under the 44-hour week, attending to his own business.

When there was something to be done and someone was wanted to do it, it was the busiest man who was chosen for the task. They were about to elect to the Presidential Chair a man who would grace it with dignity and great efficiency, a man who would endow it with his ability and enthusiasm. He wished his successor all success in the arduous year before him and knew he could look forward to that kindly consideration and help which had been given to himself during his year of office.

MR. J. R. HAYWARD, President of the Bristol Branch, who seconded, said that Mr. Templeton had said so many nice things about Mr. Newman that there was little left for him to add. He was proud that Bristol had at last got a National President. He was a big man, not only in physique, but in knowledge and experience, and he was sure that Mr. Newman would keep up the standards set by the Presidents of the past.

MR. NEWMAN, thanking the members for his election, said he was very conscious of the honour they had conferred on him and realised he had taken on a great deal of responsibility. However, his heart and soul was in the foundry industry. In spite of the difficulty of visiting all the branches and the various sections of the Institute, he would do his very best to carry out such visits during the coming year. He added that he had much pleasure in presenting the Past-President's Badge to Mr. Templeton and asked that he should continue in the chair until the end of the Annual General Meeting.

The election of Mr. J. J. Sheehan as Senior Vice-President was proposed by Mr. D. H. Wood. MR. WOOD said that last year he had the honour of proposing that Mr. Sheehan should be elected to the position of Junior Vice-President, so he had already been in training for the higher office. Mr. Wood then quoted lines from Shakespeare's "Cymbeline," which, he reminded them, they would be going to see at the Memorial Theatre at Stratford, and said that those lines were appropriate in their application to Mr. Sheehan for he, like Shakespeare's character, had "broad shoulders for the task."

MR. J. J. SHEEHAN, B.Sc., Senior Vice-President

MR. G. W. BROWN, Past-President of the Birmingham Branch, in seconding, said there appeared to be a special providence guiding them in their responsibility of choosing their officials. Speaking on behalf of the Birmingham, Coventry and West Midlands Branch, he would say with what pleasure it was and with what pride they saw Mr. Sheehan in that position. That he was worthy of the high honours of the Institute they were all well aware.

MR. SHEEHAN, replying, said, in the foundry, colleagues were bound to one another with bonds of iron and he could only say that he would meet the responsibilities of his office with the same sincerity.

For the office of Junior Vice-President, Mr. Colin Gresty had been nominated, and his election was proposed by MR. C. LASHLY, who gave a summary of Mr. Gresty's career during his membership of the Institute, recalling that he had twice been President of the Newcastle-upon-Tyne Branch, was a member of the General Council, and also of the Committee which had formulated the "Garrett Report." He was confident that Mr. Gresty would continue to give his full support to the Institute in the coming years in the same way that he had worked for it during the past 32 years.

MR. J. BELL, who seconded, said that though Newcastle was 180 miles from Glasgow, it was Glasgow's nearest neighbour. He felt sure Mr. Gresty would carry through his office with dignity, charm and efficiency, and it was always a pleasure to have honours going to one's neighbour.

MR. GRESTY, in reply, said he had the Institute's traditions very much at heart. He was honoured that they had placed their confidence in him and he would do his utmost to justify it.

Election of Auditors and Council

On the proposition of Mr. C. H. Kain, Messrs. J. & A. W. Sully & Company, of Parliament Mansions, Abbey Orchard Street, London, S.W.1, were appointed auditors for the year 1949-50.

The result of the ballot for the election of five members of the Council for two years, ending June, 1950, was announced by the Secretary as follows:—Mr. L. W. Bolton, Mr. E. Longden, Mr. J. H. Pearce, Mr. P. A. Russell and Mr. H. J. Young. A vacancy also occurred for one year on the elevation of Mr. Gresty to the office of Junior Vice-President, and this was filled by the election of Mr. S. Unsworth.

MR. COLIN GRESTY, Junior Vice-President

Vote of Thanks to Retiring President

MR. NEWMAN, proposing a vote of thanks to Mr. Templeton as retiring President, said the past year had been the busiest in the history of the Institute and that had been due in large measure to the energy of Mr. Templeton. They owed to him their grateful thanks for the work which he had done. He also thanked the members of the Council for the work they had done during the year, and coupled with those thanks the name of their Hon. Treasurer, Mr. C. W. Bigg.

MR. J. W. GARDOM, who seconded, said they were sorry to see Mr. Templeton go, but they welcomed him to that great body of men who were their Past-Presidents.

MR. TEMPLETON, replying, said he started his year of office with certain hopes and ideals, certain aims and targets, which he might achieve, but looking back he could not avoid a feeling that he had accomplished comparatively little. While conscious of a feeling of disappointment, he comforted himself with the thought that the Institute had gone on slowly and steadily. He had enjoyed every minute of his year of office and for that he thanked them all. He mentioned, in particular, past-presidents, members of the Executive Council, of the Technical Council and the various committees, and finally thanked the staff and secretaries for the work they had done and the help they had given him.

MR. TEMPLETON proposed that a cable should be sent to the American Foundrymen's Society, and the Secretary read telegrams received from the American Foundrymen's Society to the new President, from the *Association Technique de Fonderie*, from Dr. Webb, President of the Institute of Vitreous Enamellers, and from Mr. H. H. Shepherd, now in Australia.

When the meeting was resumed after a brief interval, Mr. Newman delivered his Presidential Address, which was printed in our last issue.

MR. C. W. BIGG, proposing a vote of thanks, said it was a long time since Alexander Pope wrote that "the greatest study of mankind was man," and their President was to be congratulated on underlining that very great truth. He had stressed the point that the acquisition of knowledge was comparatively simple compared with the proper and efficient utilisation of it. By the proper utilisation of such knowledge could be achieved that wisdom for which their President had quoted the Divine words.

MR. J. J. SHEEHAN, seconding, said it was typical of the foresight of their President that he should say the Institute could play a big part in overcoming the difficulties of the present industrial situation by an emphasis on the humanities to which he had referred. He had seen what the technical committees could do to adapt their industry to the scientific methods of this century and that they now had it within their power to pay attention to the humanities.

Edward Williams Lecture

Following the Presidential Address, the Edward Williams Lecture was given by Prof. Hugh O'Neill, of University College, Swansea, on "Metal Founding Through the Ages." This also was printed in our last issue.

Proposing a vote of thanks to the lecturer, DR. J. E. HURST, Past-President, said he had never listened to an address before which dealt with the subject in such a fascinating manner. The subject itself was fascinating, but he thought on this occasion he had been more attracted by the way the lecturer had dealt with the subject than by the subject itself. The "Edward Williams Lecture" was first delivered in 1935 during his own Presidential year, and the present lecture was the twelfth to which they had listened.

The vote of thanks was seconded by MR. COLIN GRESTY, and PROF. O'NEILL briefly replied.

This concluded the morning session.

Aluminium Wire. The Aluminium Wire & Cable Company, Limited, of Port Tennant, Swansea, have sent us a brochure which describes and illustrates the company's range of products, their properties, and gives an indication of their uses. The cover is particularly attractive, making use of a repeated geometrical device and carrying in a tablet its title printed on aluminium.

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larger foundries, on grounds of metal recovery, metal quality, and increased outputs, apart from fuel economy. Advantages gained by oxygen enrichment were outlined by Dr. W. C. Newell and Mr. E. C. Evans, but it was agreed that the present cost of oxygen might be a deterrent to its general use.

Foundry Fuels

"Fuel Efficiency News" gives the following short account of the recent Conference on Fuel in the Foundry organised by the British Cast Iron Research Association at Ashorne Hill, Leamington Spa.

Core-drying

The effect of humidity control and velocity of the gaseous heating medium over the cores was well brought out in the Paper on "Re-circulation of Gases in the Foundry," by Mr. E. Watkinson, A.M.I.Mech.E., and in the discussion which followed. It was shown that a balance between the rate of diffusion from the interior of the core and evaporation from the boundary was necessary to prevent surface baking. This necessitated unduly long baking times to enable the core to be dried, resulting in high fuel consumption per ton of dry goods. If, however, premature surface baking could be prevented by humidity control, and both diffusion and evaporation could be induced to proceed at the same rate, heating times would be lessened. It was mentioned that a stationary film of poor thermal conductivity characteristics formed on the core surface, and correct velocity of gas-travel through the stove reduced or broke up the film, thus shortening heating times and cutting down fuel consumption.

For foundry drying purposes the trend was to install modern recirculating systems which were designed to facilitate humidity control, to correct waste gas velocity and to reduce stack heat losses. In the Paper on "Electricity in the Foundry," by Mr. F. C. Duffield and Mr. S. Jackson, it was reported that di-electric heating of cores at a frequency of 15,000,000 cycles per second resulted in the drying of cores from the centre outwards. Drying times were quoted as being from one to three minutes at a temperature of 275 deg. F., compared with one and a half to four hours at a temperature of 520 deg. F. by the conventional methods.

Hot-blast Cupola

Mr. W. F. Driscoll reviewed the many systems in use and outlined the advantages claimed for each. Mr. F. K. Vial, of America, had stated that one ton of iron, manufactured by the cold blast method, required 216 lb. of coke, the range of tests from eighteen cupolas being 200 to 248 lb. coke. For all hot blast cupolas an average of 150 lb. of coke per ton was required, exclusive of bed coke. The average difference between the two processes was, therefore, 66 lb. per ton of iron melted, cold blast using 44 per cent. more coke than hot blast. An increase of 20 per cent. in the melting rate where hot blast was used, was also reported. In the discussion which followed, figures were quoted which estimated that cold blast resulted in 1.9 per cent. iron loss and greater silicon loss; refractory consumption was more by 0.54 nine-inch brick equivalents. Iron temperature averaged 1,400 deg. C. for cold blast heats, and 1,453 deg. C. for hot blast.

The advantages of hot blast appeared to be indisputable, but, generally, the capital cost of the heat recovery equipment might not be justified. It was worthy of serious consideration, however, especially by the

(*Concluded at the foot of column one*)

Shakespeare Statue

After Mr. A. R. Wizzard presented his Paper on "Art Foundry Practice"* to the London Branch of the Institute of British Foundrymen, there remained but a limited time available for discussion. However, proposing a vote of thanks, Mr. V. C. Faulkner, past-president, gave some interesting details of the statue of Shakespeare which adorns the vestibule of Drury Lane Theatre.

The 160 year old statue was the work of John Cheere, who died in 1787, and whose works in lead and other metals merited wide recognition. He was a well known sculptor and his output was tremendous; he was also a foundry owner, the business side of the foundry having been dealt with by his brother, Sir Henry, an Alderman of the City of London.

The statue was probably presented to Drury Lane Theatre by Samuel Whitbread, M.P. for Bedford, head of the brewing firm. He it was who, when Drury Lane had been burned down in 1809—and when, through the extravagances of Sheridan, it had seemed doomed to extinction—had raised £400,000 and had built the existing theatre. The worry of running it hastened his death. He was known to have bought up the remaining works of John Cheere when they were disposed of by the sculptor's brother, Sir Henry Cheere, in 1783 and many examples were still at the Whitbread family seat in Bedfordshire. The statue of Shakespeare was erected on the portico of Drury Lane Theatre in 1820 by R. W. Elliston, then the lessee of the theatre.

Renovation and Rehabilitation

In subsequent years the statue was covered with layer after layer of paint to a final thickness, in places of ¼ in. In 1942, in the course of some emergency bomb-damage repairs, workmen were instructed to move the statue; but they had complained of its weight, nearly 2 tons. When the base was examined, the reason for its ponderosity had become apparent; instead of being made of plaster, as had been thought, it was made of lead. That discovery, and the fear that it might be seized for its metal value, had led to its being stored in a safe place until after the end of the war. Then, when cleaned of its shell of paint, it was found to be a beautiful piece of artistry, well proportioned and of great worth. The filigree embroidery of the collar and cuffs was noteworthy for its intricacy and delicacy. The statue had since been appropriately mounted and it now carried a plaque of origin; it was housed in the vestibule of the theatre for all to see and appreciate.

Drury Lane Theatre had no claim to direct association with Shakespeare, because it was built after his death; but there was an indirect relation in that Mr. Hart, who became the first manager of the theatre in 1663, was Shakespeare's great-nephew.

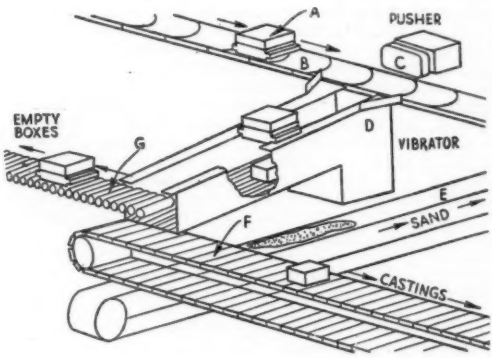
There was another and similar statue of Shakespeare, by the same sculptor, at Stratford-on-Avon. London had few statues of Shakespeare, only four others being known, and one of those was of mediocre quality. So

*Printed in the JOURNAL, April 28, 1949.

Knock-out Unit for Mechanised Foundries

It is generally understood that in all mechanised plants installed in foundries, the handling of moulding boxes and castings presents some difficulties at the knock-out station. To minimise these difficulties, British Railways have developed a unit, as illustrated and described below, incorporating a Sherwin electro-magnetic vibrator. This unit eliminates the man-handling of both moulding boxes and castings at the knock-out station.

The moulding boxes (A) are transferred from the mould conveyor (B) by pneumatic pusher (C) to the vibrating shake-out (D). The sand and castings fall from the boxes on to the grid of the trough mounted



DIAGRAMMATIC SKETCH OF KNOCK-OUT UNIT.

on the vibrator, the sand separates from the castings and falls through the grid to the return sand belt (E); and the castings travel forward along the grid to conveyor (F), which discharges them into skips attached to the cooling conveyor. The moulding boxes, which are positioned on the trough by means of guide strips, travel to conveyor (G) for return to the moulding machines. The guide strips fitted to the boxes also serve as a protection against wear of the bottom face of the moulding boxes. Three of these units will be incorporated in the chair and brake-block mechanised plants now being installed at Horwich locomotive works in the London Midland Region, each unit being totally enclosed and connected with a dust and fume removal system.

(*Continued from previous column*)

that the newly discovered example had much enriched the city's collection of such exhibits.

(For the information given, Mr. Faulkner expressed indebtedness to Mr. W. Macqueen-Pope, historian of Drury Lane Theatre.)

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Book Review

The Manufacture of Iron and Steel, by G. Reginald Bashforth. Vol. I: Iron Production. Published by Chapman & Hall, Limited, 37, Essex Street, London, W.C.2. Price 21s. net.

The reviewer agrees with the Author's statement that a new textbook was needed for students of ferrous metallurgy, and deems this book meets the situation adequately. It is pleasing to see that the time-honoured arrangements of this type of textbook have been followed, for any attempt to do otherwise would create confusion. Thus the chapters follow the normal sequence—iron ores and their occurrence—the burden, preparation of iron ore, blast-furnace fuels, reaction, slags, design, plant and equipment, refractories, operations and calculations, yet the treatment of each is such as to bring the subject up to date. For instance, the pig-iron casting machine now rightly takes pride of place over the old sand beds. Commendable progress has been made in the use of illustrations. In many of the old textbooks the pictures had no technical significance. The line drawings are clear and not spoilt through the inclusion of too many details. Bearing in mind that this is Vol. I, any reviewer is handicapped in suggesting omissions, as these may have been reserved for Vol. II. Though electric reduction furnaces are not used in this country for the reduction of iron ores, it is perhaps as well that the student should know something of their construction and operation. It is somewhat startling to learn that the principal "alloy used in cast iron is nickel." Surely pride of place should be accorded to silicon. However it is the view of the Author that below 5 per cent. it is a normal and not an alloying element. Thus, at least he has logic on his side. The reviewer is in somewhat of a quandary in criticising the section on cupola practice, as this is Vol. I, and the Author is dealing with the making of refined iron, which is somewhat different from foundry practice. The distance between the tuyeres and the charging door of the cupola illustrated is somewhat attenuated for the type of plant normally used for the melting of grey iron.

In the plant described—a cupola melting 400 tons per day—the coke to metal proportion is given as ranging between 5 and 15 per cent. The lower figure certainly looks attractive, but again the Author is dealing with refined iron and not castings production. The volume concludes with a short but adequate chapter on wrought iron. This book well responds to the demands of the technical-school classes devoted to the study of metallurgy for an up-to-date yet elementary textbook.

V. C. F.

FAGERSTA WORKS, CENTRAL SWEDEN, has recently installed an eight-ton electric steel-melting furnace. It has been inspected by Crown Prince Gustaf Adolf.

MR. J. S. MCINTOSH MILLS, of Leichhardt Foundry Pty., Limited, Sydney, is on a visit to this country. His London address will be c/o Bank of N.S.W., Berkeley Square, W.1.

House Organs

Albion Works Bulletin, Vol. 3, No. 4. Published by John Harper & Company, Limited, Willenhall. There is always something to learn and often to admire and emulate in the work of this company's Joint Production Committee, the proceedings of which are regularly reported. This issue shows that labour-turnover has been under discussion, and it seems that about 75 per cent. of the applicants for jobs are for one reason or another deemed to be unsuitable for employment. Another subject studied is that of moulding boxes, and in this connection it was decided that where moulders retain old, defective boxes for oddside frames, they were to be painted yellow, thereby ensuring that they would not be used for plate work. Always on the Agenda is the attendance record. April absenteeism showed a worth-while reduction from 6.27 per cent. in March to 5.48 per cent. The ultimate object is the reduction to 4.5 throughout the works. The apprentices are quite good at 1.96 per cent.

The Nickel Bulletin. The April issue covers some 37 abstracts in addition to the usual references to recent patents. Among these abstracts there is a more detailed reference to the new engineering material, spheroidal graphite alloy cast iron, of which there was a brief mention in the March issue. This material represents an important advance in the production of high-strength cast irons suitable for engineering uses, and will be of interest to many readers. There is, also, reference to an American specification for stainless-steel piping and an interesting extract from "Chemical Engineering" dealing with nickel alloys *v.* hydrochloric acid, which gives data on the resistance of the precious metals, silver, gold, palladium, platinum, the silicones, glass tubing, Durimet 20, and nickel and nickel Alloys. Copies of the BULLETIN may be obtained from The Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

Tin and Its Uses (No. 20). Published by the Tin Research Institute, Fraser Road, Greenford. Middlesex.

This latest issue of Tin and Its Uses reports that tin production has increased rapidly despite terrorist activities, political disturbances and shortages of steel, plant and fuel. An outline map and statistical tables give details of tin production, consumption and stocks in the various countries. World production in 1948 was 152,900 long tons, as compared with the average annual production in the pre-war years, 1935-1939, of 170,300 long tons. Stocks, at 146,000 long tons, are twice as much as before the war and are increasing at the rate of 1,000 tons per month.

The tin/zinc plating process is described by Dr. J. W. Cuthbertson, who has been largely responsible for the development of this attractive protective coating which is being used, as an alternative to cadmium, for radio and electrical components and for nuts and bolts and other small parts of motor cycles.

The Institute of British Foundrymen

Annual Banquet

CHELTENHAM SPA JUNE, 1949

A successful function in congenial surroundings

The Annual Banquet of the Institute of Foundrymen was held in conjunction with the Annual Conference in Cheltenham and took place in the Large Hall, Cheltenham Town Hall, on June 15, MR. N. P. NEWMAN, the President, in the chair.

Following the loyal toast, MR. TEMPLETON, proposing the toast of "The Borough and Corporation of Cheltenham," said his thoughts went back many years to his first visit. It was the occasion of the Cheltenham Races—the Gold Cup—and it was his first visit to a race course. He remembered that a month's pocket money was involved, but it was so disastrous financially that he resolved never again to visit a race course or to back horses. That resolution, he regretted to say, had been suitably amended in later years.

One somehow acquired the habit of associating places with certain things, such as coals with Newcastle, brass with Birmingham, income tax with Blackpool. With Cheltenham, however, one associated delightful leisured retirement. Having lived ten years in India, he knew that Cheltenham was the Mecca of many army folk, perhaps on account of the annealing effect of its water on those whose livers had been affected by the heat of the tropical sun—and other causes. Although so far he had avoided such affliction, he could not avoid the malicious thought that it would be an ideal retreat for the later years of those foundrymen whose livers had been scorched, by the fiery furnaces of the nearby Black Country.

Perhaps they might not think foundrymen were of those chosen to aspire to such a pre-view of paradise. They were, however, developing socially and their problems were now studied from the psychological angle. They knew something about human relations in industry. They indulged in thought reading to cover the requirements of their customers and pattern rapping to take care of any possible errors.

They had indeed become very refined, and when their day's work was done they went for a wash and brush-up to what now we called "ablution centres." The company might have wondered what foundrymen did and what particular niche they filled in the industrial set-up of the country. It was not what they did, so much as what they were asked to do. A foundryman was given a piece of wood and was asked to produce its shape and form in brass, aluminium, iron, or what have you. And did he do it? Yes! He put that piece of wood into a moulding-box, a clumsy contraption, if ever there was one, and then he filled the box with sand which was the most variable, inconsistent, shifty material in the whole world. Was it necessary for him to remind them of the parable of the man who tried to erect his pre-fab on sand?

The foundryman then removed the piece of wood and into the cavity it had made he put in more sand. He added chaplets and studs. He cut in-gates and down-gates. He closed up the whole thing and into the box of tricks poured molten metal. He then lit his pipe, put on his coat, and went to the "local," where he drank a pint of beer to the success of his venture. That night he said his prayers, and it was there that foundrymen were different from most men. They were simple modest folk. They had none of the delightful, carefree assuredness of the scientist or politician, neither had they the heaven-born infallibility of the engineer. They differed, too, from town and borough councillors, and they did so because deep down somewhere in their make-up they had faith. They needed it.

So when he prayed, the moulder humbly asked that the casting he had made that day might be a good one. He went back to work next day and, to his great joy—perhaps amazement—the casting was a good one! That night when he said his prayers he asked for an explanation why it was a good one for, though Heaven might know the reason, the moulder was never quite certain.

But his job that night was to talk about the Borough and Corporation of Cheltenham, and, like a complete egoist, all he had done was to talk about himself and his band of brother foundrymen. He would recommend the members of the Institute to examine the beautiful architectural ironwork which ornamented the balconies, verandahs, and door hoods in Cheltenham, for nowhere else could that early nineteenth-century craftsmanship of their industry be seen to better advantage.

He believed that under the new Boundary Commission, the Borough might become one of the ten county boroughs in the country. They all hoped this stature would be achieved when the matter went before Parliament. There was much that could be said of that beautiful town were there the time. Its situation among the Cotswold hill country, with its streams and woods and charming villages, was a perfect setting. The famous Promenade had its avenue of trees, its gardens and parks and lawns and, incidentally, he could not help thinking what a wonderful market place it was for the sale of lawn mowers which their industry made! Cheltenham was famous also as an educational centre. Its College had been established for more than a century and there were many other colleges and schools to give it its air of culture. Music and the arts flourished in Cheltenham, and he noticed that soon it would be holding the annual festival of British Contemporary Music.

Annual Banquet

All that indicated an enlightened culture which had been created by years of enterprising and enlightened civic government. He had not the mastery of words, or quality of expression to pay Cheltenham all the tribute it merited. Nor was it seemly to gild fine gold or paint the lily. In Cheltenham they had been handed down through the years a great and lovely heritage. Proposing the toast to the Borough of Cheltenham and to the civic body of which the Mayor was the head, might he wish him God Speed and all good fortune in the work he was doing to hand on to those who followed him an even greater and more lovely heritage!

Responding to the toast, ALDERMAN SMITH, the Mayor, said whenever he looked at the motto of the town, "Salubritas et Eruditio" (health and learning)—he could not help feeling an admiration for those who first chose it, because it was fitted so eminently to its purpose. Health and learning in a nutshell contained the key to the character of the town and emphasised two of its most important aspects both for the resident and the visitor. It had also a much wider application in that it expressed an ideal of human life—the healthy mind in a healthy body—which had been sought after in all ages since classical times and which had never been bettered. The man or the place with that ideal achieved had surely nothing else to ask of life and was indeed blessed by the gods.

In Cheltenham they were proud to see that the Institute for the first time in its long and honoured history had a President from the West Country, a near neighbour of that shrine of learning. He offered their congratulations to Mr. N. P. Newman and wished him a happy and successful year of office. He deeply appreciated the cordial references which had been made to the Borough of Cheltenham and was very certain that the sentiments so felicitously expressed would afford as much pleasure to the Council as to every citizen of that "Garden Town of England."

It had been both a pleasure and a privilege to extend a most sincere welcome to the Institute of British Foundrymen and to all who shared in its deliberations in Cheltenham. He hoped that, in the genial and always friendly atmosphere of Cheltenham, their proceedings would be invested with urbanity and fruitfulness and that they would be carried out in a spirit of mutual helpfulness and progressive development.

"The Institute"

Proposing the toast of "The Institute of British Foundrymen," SIR ALEXANDER RAMSEY, Director of the Engineering and Allied Employers' National Federation, expressed the great pleasure and honour it was for him to take part in the conference and to couple the name of their President with the toast which had been entrusted to him.

He had been looking at the syllabus of the Institute and had been greatly impressed by it. From many quarters in recent years it had been said, perhaps in the propagation of certain ideas, that British industry was somewhat slow in getting off the mark, rather too conservative (he did not mean politically) in its methods, and did not rise quickly enough to the occasion; in other words, that the employer had got himself behind a wall and was not prepared to admit even the existence of competitors.

Their great Institute, meeting at its 46th annual conference, was a complete contradiction to any allegation of isolation of that kind. They had been approaching their problems in a scientific way and they had been doing something which was more and more useful and necessary. They were to-day pooling their ideas.

There had been an impression that this old country had lived so long industrially that we were tending to sit down and look round. In the realm of research they were very glad indeed to have all the help which was given them by such authorities as the Government, but at the same time it had to be remembered that the Government could never relieve them of the responsibility of doing things for themselves. Their organisation for a great many years had been a pioneer in research, solving some of the problems which appeared to bother Mr. Templeton. When they had got the basis of their knowledge to the point when their ideas could be exchanged, they came together at their Annual Conference and to their everlasting credit did their level best to spread that knowledge.

His own contact with foundrymen had been in relation to the human aspect of the job. He had had to rely on the co-operation of members of the Institute in dealing with the workers' human problems. In that approach, the Institute had shown the same keenness and intensity as they had in dealing with technical and scientific problems.

Mr. Templeton had referred to engineers being full of celestial confidence. The engineer, he said, worked at something, planned it and knew what the result would be, whereas the ironfounder could not. Personally, as an engineer, he did not take that view. He had always regarded the ironfounder as being the godfather of the engineer. He was proud of what the engineer had done from the days of earliest history. The man who made himself the first stone axe might be described as the first engineer. Then came the nomad tribes of the East striking across Asia, who, using fire to cook a meal, found a stone which under the influence of heat gave them a soft ductile metal which now we called copper. He thought that there we had the beginning of the first metallurgist. Then came a hiatus, and it was not until 200 years ago that James Watt gave us steam and Murdoch came along with his gas discovery. Then they got the spinning jenny and, coming down to modern times, there was wireless and the great ships and all the rest of it. All those things might not appear to have any close connection with foundrymen, but the fact was, the foundryman was in it all at every stage. Those developments would have been impossible without him. So, therefore, whether in their deliberations they discussed the metallurgical content of a cannon ball found after the battle of Lichfield, or some equally abstruse problem, certain things were quite clear. They were that the Institute, in expressing itself through its Annual Meeting, was doing a service to the foundry industry, to the engineering industry, to the

economy of the country and to the well-being of our people. It was, moreover, doing it with great knowledge, great effort and great friendliness.

He was sure their Chairman would feel that he was following a great tradition and entering a goodly heritage. His impressive presence, his ability and his sense of responsibility to his neighbours and the community gave them the fullest assurance that that was the man for the job of President.

President's Reply

MR. N. P. NEWMAN, the President, began his reply by thanking Sir Alexander for the complimentary things he had said about the Institute and himself. Speaking personally, and for the Institute, he assured Sir Alexander that they were proud of the fact that theirs was an efficient industry. He used the word efficient because far too often they heard the foundry industry described otherwise, but over-all he was convinced the foundry industry was efficient.

He wished to pay tribute to individuals and officials who had organised the Conference. He mentioned, first, Mr. Tom Makemson, their Secretary, who had worked extremely hard to make the Conference a success, and he had been ably assisted by Mr. George Lambert. He also thanked all the staff at Manchester for all that they had done, on behalf of the West of England Branch; and, on behalf of the assembly, he thanked the Executive Committee of the Conference who had stood behind him and the Manchester office in making the various arrangements. He regretted the absence of the Conference Treasurer, Mr. A. V. Biggs, who was unable to be present that night because of illness, and on their behalf he had sent him a message of good cheer. He thanked also Mr. W. R. Marsland, his shadow, for the help he had given him, and the Mayor and Civic Authorities for all they had done; further he expressed thanks to Mr. Wilkinson and his assistant Mr. Marshall for organising their entertainment in Cheltenham.

They had with them that night the daughter of the first member of the Institute, Mrs. Chapman, whose father was Mr. Frederick Finch. They welcomed her among their midst and paid tribute not only to the memory of their first member but also to their first secretary and first treasurer.

If he might make one personal and friendly reference he would like to say how proud he was to have his father present that night. At the age of 75 he had been unfortunate in losing a leg. He knew something of the effort he had made to try and be with them that night and he honoured him for it. His father never ceased to remind him of the fact that he entered the industry at the age of 15 and that they made far better castings then than were made to-day. He also welcomed the guests from the Continent of Europe and Mr. and Mrs. F. C. E. Sleap from Cyprus, their only members in that country, and Mr. Hobbs from South Africa.

Finally he regarded it as a personal favour that Sir Alexander Ramsey should have come such a long way to be his personal guest.

"The Guests"

Rising to propose the toast of "The Guests," MR. J. J. SHEEHAN, the Senior Vice-President, before proceeding, asked the assembly to rise and drink a special toast to Mr. Newman's father. This was done with enthusiasm and applause.

Mr. Sheehan then went to to propose the toast of "The Guests." He said that his was a difficult but pleasurable duty. He had attempted to make a classification of the guests so that he could have an orderly sequence of thought and expression. They had with them distinguished representatives of the Learned Societies, Institutes, Associations, and Federations; civic dignitaries of both Cheltenham and Gloucester; their President's relations and colleagues; visitors from overseas, their guests' ladies and their own ladies, as well as their personal friends, who knew all their faults and failings, but still forgave them and gave them sympathy and sustenance in the trials of after dinner speaking and listening.

In the first category they had Sir Alexander Ramsey, director of the Engineering and Allied Employers' National Federation, formerly a director of Ruston & Hornsby, Limited, and of the Enfield Cycle Company. At one time he was M.P. for West Bromwich and was a vice-chairman of the West Bromwich Albion F.C.

Sir Andrew McCance was President of the Iron and Steel Institute, a member of their own Institute, and the recipient this year of the E. J. Fox Medal. He was also vice-chairman and managing director of the great Scottish steel company of Colvilles. He was a distinguished metallurgist and had played a prominent part in the development of special steels and of the Clyde Alloy Steel Company.

They had the honour to have Dr. Webb, President of the Institute of Vitreous Enamellers, those excellent people who gave a bright and shining finish to otherwise dull and uninteresting castings; Mr. T. A. Hammersley, the President of the Foundry Trade Equipment and Supplies Association; Mr. F. A. Martin, President of the British Steel Founders' Association; Mr. A. W. Grant, Chairman of the Engineering and Allied Employers' West of England Association, of which their President was a prominent member; Dr. J. G. Pearce, Director of the British Cast Iron Research Association, who was well known and esteemed by them all; Mr. G. L. Bailey, Director of the British Non-ferrous Metals Research Association, and Mr. G. H. M. Turner, the President of the Refractories Association of Great Britain.

In the category of civic dignitaries they had as guests the Mayor and Mayoress of Cheltenham. The Mayor was a leader of the "Dig for Victory" Campaign and Chairman of the Allotments Committee and the Horticultural Committee. They had also Mr. J. Chesters, President of the Cheltenham Chamber of Commerce, Mr. W. H. Hartwell, President of the Gloucester Chamber of Commerce, and Mr. F. D. Littlewood, the Town Clerk of Cheltenham, who had been very helpful to their Secretary respecting the Conference arrangements.

Annual Banquet

In the classification of their President's relations and colleagues they had to place pre-eminently Mr. and Mrs. C. P. Newman, the President's parents, and Mr. and Mrs. George Lister, Mrs. Noel Newman's parents. Mr. Hedley Newman, who was not related, though there should be something in the name—he was a member of the firm of Newman Industries, Limited, engineers and steel founders, a firm which had progressed rapidly in recent years—and Mr. Frank Lister, President of the West of England Engineering Employers' Association and a director of R. A. Lister & Company, of Dursley.

In conclusion, he would recapitulate by saying they wished to welcome the representatives of the learned societies, the true representatives and creators of our civilisation; the civic dignitaries who graced it and the ladies who sustained it; and finally, their President's people, who made him possible.

Visitors Reply

SIR ANDREW MCCANCE, President of the Iron and Steel Institute, said he rose to respond with a certain amount of hesitation and uncertainty. He felt he stood before them as a very questionable guest. For the benefit of those who might think otherwise it was not a question of character, but one of status. For more than 20 years he had been a member of their Institute and had counted himself within the happy circle of those who had a right to attend their meetings. When he received the invitation to reply on behalf of the guests, he wondered what mischance had put him beyond the pale. Knowing how tactful their secretary was, he looked up at once to see if he had paid last year's subscription. Assured on that point, he could only conclude that the invitation was a gesture of kindliness to give him some unmerited promotion.

A man was known by the company he kept and to elevate him, even for one evening, to the same level as that of their many distinguished guests was an act of camouflage which he sincerely hoped would succeed. At least he hoped it would succeed so far as Cheltenham was concerned, for he was under no illusions as to the very slight chances of its success at home. However, if he might assume the airs of his new position, he would say that the responsibility of being a guest appealed to him greatly. In a modern world torn by distrust and disagreement the relationship of a guest to his host seemed to shine as a true example of helpful co-operation. If ever he were placed in the position of host, he was going to favour as guests only strong silent men. The thought occurred to him how much pleasanter it would be for the whole country if all the places in the Government and in Parliament were filled with men of that breed.

He wished at that stage to receive some help from the other guests which was to conclude with them some pact of mutual assistance so that they could express to the President a united and adequate "Thank you" for all the kindness he had shown to them. When he looked round and saw the look of happy contentment on the faces of the guests, he felt he was receiving from them their full support and help in making his contribution; that was to express to Mr. Sheehan and to the Institute the very grateful thanks of all the guests for the hospitality and kindness shown to them that evening and for the toast which had been so generously proposed by Mr. Sheehan.

At the conclusion of the toast list the PRESIDENT said he had one final duty to perform. On behalf of all present he had to present to Mrs. Templeton, the wife of their immediate Past-President, a handbag as a token of their esteem for the very charming way in which she carried out the duties of the wife of the President during the past year.

Responding to the President's presentation, MRS. TEMPLETON said when her husband became President a year ago, she had many acquaintances; now she hoped she had many friends in the Institute. Their gift would remind her of the great kindnesses she had received everywhere on her husband's visits to the Branches during the year. The evening concluded with dancing and an entertainment.

J.I.C. Convention New Date

The Fourth Annual Convention of the Joint Iron Council, which, as recently announced in these columns, was arranged for October 19, has been postponed. It will now take place at the Dorchester Hotel, London, W.1, on Wednesday afternoon, November 23, 1949, and will be preceded by luncheon at 1.0 p.m.

AMONGST THE BIRTHDAY HONOURS recently announced is the award of the M.B.E. to Mr. W. H. Gardiner, chief maintenance engineer of W. H. Dorman & Company, Limited, manufacturers of Diesel engines. Mr. Gardiner, who has received the award in recognition of his long service in keeping the plant of the company at full capacity during times of particular difficulty, has been in the employ of Dorman & Company for over 30 years.

IN AN ADDRESS TO Willenhall Rotary Club last week—the club's Industrial Day—the President of the National Trades Technical Society, Dr. J. E. Hurst, attributed the tremendous growth and development of the country's ironfounding industry largely to the invention of a Sedgley (near Dudley) man—Abraham Darby—who in 1707 discovered a method known as "green sand" moulding.

Dr. Hurst, who is managing director of Bradley & Foster, Limited, of Darlaston, said that present production of the ironfounding industry was at the rate of about 3,500,000 tons of castings annually, and the Midlands, comprising Staffordshire, Shropshire, Worcestershire and Warwickshire, was the country's second largest producing area.

Problems in Bronze Foundry Practice*

Review of Practical Considerations

By Austen J. Smith, Ph.D.†

Introduction

Of recent date a great deal of attention has been given to the possibility of achieving sound castings of the brass and bronze alloys through application of sound scientific principles to the melting and gating procedures. Many of the problems became evident during the war when virtually all foundry products were manufactured to government specifications, with which many foundries had had no previous experience. As a consequence, research in the bronze foundry was actively advanced after a comparatively long period of relative lethargy.

The many recent Papers published in England have shown that the problems have been the same on both sides of the ocean. The British publications have been most eagerly awaited in the United States and the names of a number of the British workers are almost as familiar to the members of the American Foundrymen's Society as they are to the members of the Institute of British Foundrymen.

Rather than to present, as an Exchange Paper, a report on original research on bronze foundry practice, it seems more desirable to review some of the problems for which foundrymen do not yet have an answer and to touch on some of the work that is going on in the United States.

Although Finch, in a most stimulating Paper[1] before this Institute two years ago, described the process of the freezing of castings, a somewhat different point of view makes it desirable to reconsider the whole casting process and to discuss some of the factors affecting the final product.

Mechanism of the Freezing Process

To get some idea of certain of the factors that affect the freezing process, it will be well to describe a simple experiment on freezing. The ideas brought forth are not entirely new. Something of the same substance was presented both by Finch[1] and by Frear.[2] A series of cylindrical blocks 4½ in. long and nominally 2 in. diameter, but with a generous taper, were moulded in green sand with the larger end up and open to the air. Castings were poured at different temperatures down to a temperature near that of initial solidification. Pouring was rapid, so that the temperature in the mould at the end of pouring was very little below the actual pouring temperature. The alloy used was "steam" bronze of the nominal composition 6 per cent. Sn, 3.5 per cent. Zn, 1.5 per cent. Pb, balance Cu. The resulting castings were split down the centre and etched. In Figs. 1 to 5 the etched sections are shown sketched schematically, salient features being brought out more readily by sketching than by photography. Pouring temperatures from 2,400 deg. F. (1,315 deg. C.) down to 2,000 deg. F. (1,093 deg. C.) at 100 deg. Fahrenheit intervals are shown. With a pouring temperature of 1,950 deg. F. (1,065 deg. C.) a grain size of some $\frac{1}{16}$ in. diameter was obtained, and at 1,900 deg. F. the grain was even too fine to estimate by visual inspection. Initial solidification in this alloy occurs at about 1,870 deg. F. (1,021 deg. C.). The block poured at 1,900 deg. F. (1,037 deg. C.) showed a general over-all shrinkage and the top was filled with blowholes indicating that freezing took place too rapidly to permit escape of entrapped gases.

Freezing commences at points in the liquid, that is, at nuclei, which may be particles of foreign matter or may be associations of two or more atoms brought about through temperature change alone. As freezing progresses, growth from the nuclei will proceed in the direction away from which heat is being abstracted, but still along definite crystallographic axes. There is a limiting angle, as yet not determined, which the preferred axial direction may make with the cooling direction and beyond which growth will not occur. This limiting angle is, of course, modified by adjacent freezing crystals. Were there to be but a very slight temperature gradient the crystals would tend to grow in all directions from the nuclei as cooling progresses, the final shape of the grains being determined by interference from adjacent growing crystals. As the temperature gradient becomes greater the growth becomes more uni-directional. Superimposed on this effect is the temperature over which both solid and liquid can co-exist—the freezing range. A narrow freezing range accentuates the effect of temperature gradient, a long "mushy" range rather obliterates it.

When molten metal is poured into a mould the metal in contact with the surface of the mould will form nuclei at a very high rate, for the metal will be very quickly cooled below its freezing point. Many of these centres of crystallisation will be oriented unfavourably for growth to proceed, others will be in a more favourable position and growth will proceed until interfered with by the growth from those centres which are highly favourable in their orientation. Hence, at the surface of a casting there is a thin layer of fine grained material almost completely randomly

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Problems in Bronze Foundry Practice

oriented. This as-cast surface rarely leaks unless unsoundness is very great. Leakage often becomes apparent only after this layer has been machined away The layer has been sketched in Fig. 1 (much grosser than it actually exists), but it is present in all castings with the exception of those whose mass is so great with respect to the cooling velocity that the surface layer is re-melted.

Effect of Pouring Temperature

If the metal be poured hot, the metal remaining at the centre after this initial surface crystallisation will still be too far above the melting point to form new crystallisation centres. As a consequence, freezing metal will build up on the surface crystals which are favourably oriented for growth, and the product will be a dendritic structure, the dendrites in many instances growing toward the centre until stopped only by dendrites growing from the opposite surface. This is illustrated in Fig. 1. If feeding cannot wholly replace the solidification contraction with this freezing pattern, centre-line shrinkage results. Since centre-line shrinkage is not too often of serious consequence in the copper-base alloys it will not be considered further here.

As the pouring temperature is lowered, the metal at the centre drops into the nucleation temperature range so that new points of crystallisation are formed at the centre even while dendrites are growing inwards from the surface. As the dendrites approach the centre they will be checked from further growth by these new grains, which will be more or less equi-axed. This condition appears first in Fig. 2, and is very pronounced in Fig. 4, sketched from a casting poured at 2,100 deg. F. (1,148 deg. C.).*

Finally, at 2,000 deg. F. (1,093 deg. C.), nucleation at the centre is far too rapid for dendritic growth to take place, and the entire block takes on an equi-axed structure except for a few small dendrites. With still more rapid nucleation resulting from yet lower pouring temperatures, the size of the equi-axed grains becomes reduced and there is a complete disappearance of any significant dendritic growth. Nucleation at the centre can be pronounced only in alloys with a freezing range since such alloys may form nuclei over a range of temperatures permitting freezing to take place at a number of centres at once. In a pure metal such as pure copper, the invariable freezing habit is dendritic down to the point where the metal can no longer be poured, for, with no freezing range, any temperature gradient is significant, and the gradient can only be from the surface inwards.

As indicated in this first experiment, for alloys with a mushy range, a fairly steep temperature gradient is required for dendritic growth, that is to say, a marked difference in temperature from the surface of the casting to the centre. If the difference be less than a certain amount, equi-axed grains may grow in the centre. The mould surface produces a marked chilling effect on the first metal coming in contact with it. If the mould is heated greatly, as by a large mass of metal taking a considerable time to freeze, the effect of a steep temperature gradient is lost regardless of the pouring temperature. Thus, in alloys with a mushy range, there would appear to be a limiting sectional size beyond which it would not be possible to have a wholly dendritic structure regardless of pouring temperature. Also, with thinner sections there would be a lower limit below which equi-axed grains would be unable to form, no matter how low the pouring temperature.

Application to Feeding

The mode of structural growth is very important in the feeding of castings. The gradients required to produce the two different types are susceptible of measurement and, while they will be different for different alloys, they should offer excellent correlative possibilities. Factors affecting the operation of temperature gradients over and above the temperatures of metal and mould at pouring include, among others, rate of heat transference between metal and mould, heat conductivities, and specific heats. Many attempts have been made to study gating practices from the theory of heat transference alone. A recent endeavour in this direction was that of Faber and Doll.[3] However, such evaluation is only a part of the problem, albeit an important part. Work is also being carried on in making direct measurements of heat transference from metal to mould, as well as studies that are being carried out by the electrical analogy method. The work now being carried out at Columbia University under the sponsorship of the American Foundrymen's Society, Heat Transfer Committee, is expected to make a very important contribution to this subject. Their reports have appeared regularly in the Transactions of the Society[4]. The use of the ratio of volume to surface area by many foundrymen is a somewhat less rigorous attempt in this same direction.

Contraction Characteristics

With few exceptions, metals continuously contract when the temperature falls from the pouring temperature to room temperature. The contraction is not uniform, but is different for each phase. Further, a separate discontinuous contraction is shown for each phase change with falling temperature. Thus, with the normal solid-solution alloy cooling from the molten state, there is shown liquid contraction, solidification contraction, and solid contraction. Some reasonably good measurements have been made of liquid contraction; for the brass and bronze alloys the work of Sager and Ash at the National Bureau of Standards a number of years ago still appears to be quite reliable[5]. Solid contraction is simply a re-statement of the familiar thermal coefficient of expansion.

Solidification contraction is much less easily defined. If the alloy freezes over a range of temperatures, then all three varieties of contraction will be taking place simultaneously, for liquid and solid will both be present and also liquid in the process of transforming to solid. Measurements of this grouped "solidification" contraction have been made for a number of

* Note :—In the original work, fifty degree (Fahrenheit) intervals were employed, but the pattern is well represented at the one-hundred degree intervals sketched here.

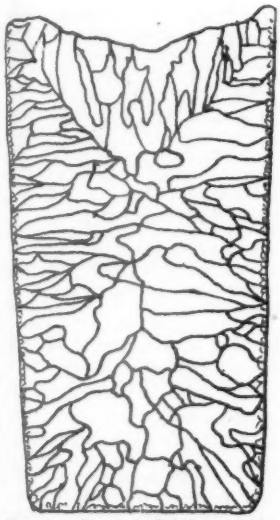

FIG. 1.—CAST AT 2,400 DEG. F. (1,315 DEG. C.).

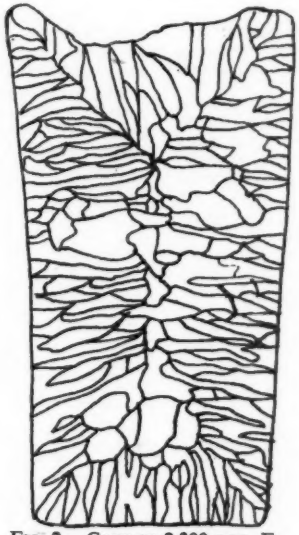

FIG. 2.—CAST AT 2,300 DEG. F. (1,260 DEG. C.).

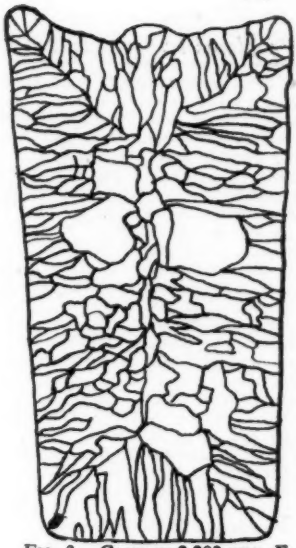

FIG. 3.—CAST AT 2,200 DEG. F. (1,204 DEG. C.)

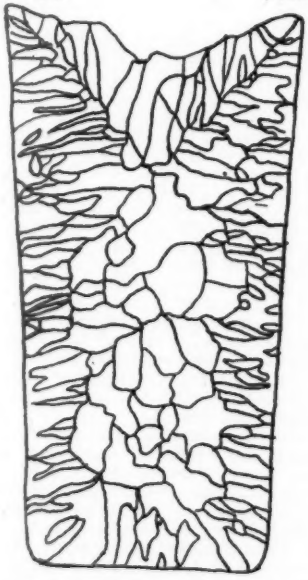

FIG. 4.—CAST AT 2,100 DEG. F. (1,148 DEG. C.).

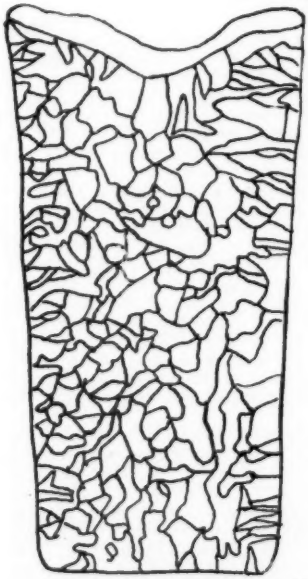

FIG. 5.—CAST AT 2,000 DEG. F. (1,093 DEG. C.).

FIGS. 1-5.—SKETCHES SHOWING THE CRYSTAL STRUCTURE OF BRONZE BLOCKS CAST AT TEMPERATURES BETWEEN 2,400 AND 2,000 DEG. F. AT 100 DEG. F. (55 DEG. C.) INTERVALS.

alloys, for the copper-base alloys also by Sager and Ash in the references cited. Little recent work has appeared on such measurements for these alloys. The measurements that have been made are restricted to the conditions of the experiment, since cooling rates govern the composition of phases as they pass through a transformation range and hence affect also the contraction characteristics.

This is particularly true in freezing processes because of segregation effects, which at times may be extreme. However, the measurements are useful as a first approximation. In the study of risering practice, it is not possible to measure the behaviour under conditions of true equilibrium, since such conditions are virtually impossible of attainment. With sufficient data taken under controlled experiment it should be possible to extrapolate to conditions of equilibrium which would make the ideal reference point. In the Author's knowledge, no work of this type has been attempted.

Little is known of the dependence of the observed contraction characteristics on cooling rates. An evaluation would call for knowledge of the segregation behaviour and of the phase equilibria of the alloys in question. With the gathering of this knowledge, there again should be excellent possibilities for correlation.

Feeding of Castings

At this point it will be of interest to consider the problems involved in the production of a sound casting. The blocks described earlier may be thought of as analogous to risers on regularly gated castings. In order to fulfil the purpose when used as a feeding head, the riser must remain molten as long as the casting is above the temperature of final solidification. As the casting solidifies contraction takes place and the resulting voids must be filled with molten metal from the riser. Obviously, feeding cannot take place if the riser, or the gate between riser and casting, is not sufficiently molten to permit flow.

Without inquiring further into the mechanics of flow, a difference of temperature is required between casting and riser to permit flow to continue until the point at which the casting has solidified. As is well understood, the riser as a feeding head is fulfilling a twofold purpose it is providing liquid metal to offset the shrinkage taking place in the casting and is establishing a local region of high temperature in the casting to promote directional solidification so that the metal can be fed.

Frear[5] has conceived of a block-like growth of the dendrites, the blocky nature of the growth making feeding exceedingly difficult. On the other hand, if nucleation takes place in the central portion of a riser from inadequate temperature it can readily be conceived that such associations of atoms could greatly interefere with metal flow, preventing the riser from acting effectively. Practical observation of the Author has been that if sectioned feeding heads show large equi-axed regions, little feeding will have taken place. The provision of such risers with hotter metal—indicated by a more fully dendritic structure— has usually been effective in avoiding unsoundness in the casting.

The same reasoning applies to the casting itself. A casting showing considerable equi-axed structure adjacent to the feeding head will be fed only with difficulty, regardless of the inherent ability of the head to feed. As indicated earlier, in heavy sections the effect of temperature gradient is small and an equi-axed structure is to be expected. Such castings are very difficult to cast soundly, and the normal procedure is to cast as cold as possible in order to keep contraction to a minimum. With such practice, little feeding takes place from risers, the risers functioning almost solely as heat reservoirs.

Schwartz[6] in the 1945 Foundation Lecture of the American Foundrymen's Society went into the current theory of solidification quite thoroughly, and re-reading of his Paper is instructive in studying practical problems arising in the foundry.

External Influences

The problems discussed thus far have been concerned only with the physical behaviour of solidifying metal, assuming the metal, as it lies in the pot before pouring, to be in an ideal condition for producing a sound casting. These problems are complex and, unfortunately, in a study of them it is exceedingly difficult to control the other variables that enter into, yet are not a part of, the freezing process. Gas, whatever, the source, is the principle offender, and has long been a subject for discussion among foundrymen.

Of the gases, hydrogen appears to be the worst offender, whatever the metal being cast, ferrous or non-ferrous. A relatively high solubility in the molten state and low solubility in the solid state means that large volumes of gas may be rejected in the freezing range in melts which have been exposed to adverse atmospheres. Hydrogen, either as the element or combined, is present in copious quantities in melting atmospheres provided by gas and liquid fuels. With electric melting water vapour in the air can be dissociated at melting temperatures by carbon or carbon monoxide from crucible or lining materials, coke covers, *etc.*, yielding free hydrogen. Carbon monoxide has been strongly suspected in the past of being itself a cause of porosity. Current opinion seems to be, however, that the carbon monoxide—water vapour reaction, which produces hydrogen, is responsible. The industry is indebted to Pearson and Baker[7] for clarifying this point.

Under the auspices of the Non-Ferrous Ingot Metal Institute, Eastwood and Kura[8] carried on rather extensive research on alloy 85-5-5-5. The work was centred chiefly about evaluating the test-bars currently used both in the United States and abroad. The inadequacies of the test specimens led the research into paths not anticipated at the start. The question that presented itself to the reader was not so much the inadequacy of the test specimen but whether it is possible from present knowledge to design any casting which would be representative of the metal in the pot

as the mould is poured. As is well known to foundrymen, a wide scatter results in pouring successive test specimens from the same pot of metal into supposedly identical moulds. This scatter is normally attributed to faulty selection of test-specimen design. A point often overlooked is that there is just as much scatter in quality of castings made from the same heat and for the same reasons. Eastwood's suggestion of a larger number of test specimens per heat, although not economically feasible, would, if followed, give a truer picture of the total lot of castings made from a heat than does the single test specimen.

The quality of the metal as indicated by the test specimen is usually considered as a measure of the degree of gassing of the melt. Badly gassed metal will show up in almost any test specimen cast under normal foundry conditions. The gassing to be considered is generally taken for granted to be hydrogen. Obviously, the rejection of gas in the dendrites in the freezing range will interfere with feeding mechanisms, resulting unsoundness and lower density in the casting. In most of the work that has been carried out, the effect of gas rejection has been considered only with respect to solubility at atmospheric conditions. However, in gas-free metal a virtual vacuum should exist in the voids opened up by simple freezing contraction. The "Williams" atmospheric riser postulates such low pressures and the effectiveness of the riser, especially for steel castings, gives excellent proof of this. Inasmuch as gas solubility decreases with decreasing pressure in accordance with Sievert's rule, the gas dissolved in metal adjacent to voids developed through this freezing contraction will be rejected to a much higher degree than anticipated from knowledge of the solubility at atmospheric pressure. It must be concluded that any confined void developed through freezing contraction will contain rejected gas. The gas pressure will diminish with lowering gas contents of the melt, but will not be absent except in metal which is absolutely gas free.

In line with the above reasoning, zinc in the brasses and zinc-bearing bronzes can be assumed to vaporise into the voids at the low pressures involved, thus contributing a certain micro-segregation to the alloys.

The question that arises is whether this rejected gas (or vapour) can be re-dissolved sufficiently rapidly to permit complete feeding to take place. The Author, from observation of many bronze micro-samples, doubts the probability of such re-solution. In all the samples examined, none has been found completely free from shrinkage of the sort variously known as incipient shrinkage or micro-shrinkage. Included in the examination were the occasional test specimens showing exceedingly high physical properties. To the Author this is one of the reasons why the as-cast properties never quite equal the properties of the same materials after being worked and annealed.

A major problem confronting metallurgists and foundrymen is that no good method has been developed for determining gas contents, either of a melt or of a casting of the copper-base alloys. Thus far, the only study that it has been possible to make of the effects of the gases has been by subjecting melts to the atmospheres of interest and assuming full solution, whatever the solubility may be. Development of an analytical procedure would be of the greatest value in studying these problems.

Effects of Lead

In the work of Eastwood and Kura[8] attention was paid to lead distribution in the leaded bronzes, and an attempt was made to determine a factor governing the effects of lead on physical properties. Especially through the relatively new technique of micro-radiography, a great difference was found both in the size and distribution of the lead particles from melt to melt, and physical properties suffered rather markedly with adverse lead distribution. Further work on this problem is awaited with interest.

In 1931 Doughty[9] called attention to pinhole formation adjacent to cores in the bearing bronzes. As a result of various experiments, he attributed the pinhole formation to reaction of lead oxide in the metal with core binders. Such possibility was not touched on by Eastwood and Kura, although test specimens of excellent properties were produced, regardless of melting atmosphere, by pouring into moulds baked at high temperatures. Although Doughty was concerned only with alloys containing 10 per cent. or more of lead, and zinc additions aided the elimination of the pinhole defect, alloys of the 85-5-5-5 type commonly develop pinholes when cast in sands high in cereal binder. Since pinhole formation from this cause is not prevalent in the low lead (under 2 per cent.) or lead-free bronzes (pinholes, of course, may arise from other causes), but becomes so as the lead content increases, it would appear that Doughty's reasoning can be extended to the 5 per cent. lead alloys. The rôle of lead is peculiar, and, until Eastwood's work, little attention, according to published literature, has been paid to lead since Doughty's observations were made. Much further work is needed in this direction.

Melt Quality

In the research work that has appeared, properties of castings have been predicated on an arbitrary "melt-quality." As generally implied, high melt-quality defines melts which are so low in deleterious gases and other impurities that the metal, as it is poured from the pot, is capable of producing superior castings if the moulding sand and gating technique be correct. This melt-quality is ordinarily measured by the properties shown in test-specimens cast from the melt. As pointed out earlier in the Paper, inadequacies of the test-specimens as a measure of melt-quality make for rather poor definition of this quality. Furthermore, a test-specimen yields only a *post mortem* measure of the quality of a heat, whether good or bad.

To overcome this a research project is now being carried out at the University of Michigan under the sponsorship of the Brass and Bronze Research Committee of the American Foundrymen's Society for the development of a fracture test. By correlation of a fracture examination test with the properties of a

physical test-specimen from the same heat, it is hoped that a useful test can be developed which can be quickly performed and thus show the melt quality of a heat before the heat is poured. Such a test would be of the greatest value to the bronze foundryman in the avoidance of rejects from melts which have gone off the track. This project has only recently been initiated and although it is a very difficult task it is earnestly hoped that a useful test procedure will result.

Drossing

Another cause for rejection of castings is included in that general term used by all foundrymen, "dirt." Dirty castings may result from a variety of causes. Here it is proposed to touch on only that variety which results from entrapped dross.

At normal pouring temperatures virtually all alloys oxidise readily in contact with the air. In most alloys the formation of an oxide skin is protection against further oxidation. If it is possible to form and keep intact a single oxide layer, clean castings will result (if other conditions are correct). In the usual running of a mould turbulence of the metal stream will cause breaking up of the first oxide layer and present fresh metal to be oxidised. Thus, it is possible for large amounts of metallic oxide to be entrapped in the casting; such castings are described as "dirty." All castings are susceptible to this type of defect, but in alloys which form refractory oxides of a density near that of the alloy. such defects may become a serious cause of rejection. The aluminium bronzes produce clean castings only with the greatest of care because of the formation of the highly refractory aluminium oxide.

By avoiding turbulence and maintaining a streamline flow, the first-formed oxide skin will not break away to expose fresh metal and this technique is an objective in sound gating practice. The mechanics of flow in bronze casting have been studied extensively at the Naval Research Laboratory and a report on this work has been made by Robertson and Hardy.[10] The theory of turbulent and streamlined flow has been carefully considered and experiments have been performed to test the application of the theory. The underlying principles developed by Robertson and Hardy are a noteworthy advance and show the way for a great deal of valuable experimentation.

Conclusion

It has been the intention in the present Paper to review the mechanics of solidification of the brass and bronze alloys and to touch on a few of the factors that interfere with normal solidification processes. Recent American investigations on these factors have been discussed, not from the standpoint of a critical review, but more to indicate the present state of knowledge. There is no room for opinion in science. However, factual data have been neither presented nor discussed. The writer has endeavoured to point out what is *not* known rather than what *is* known, in the sincere hope that someone, whether research worker or practical foundryman, will be inspired to follow up that spark of an idea which will help advance the foundry art to a true science.

Acknowledgment

Any ideas the Author may have presented in this Paper are the result of many experiments and of long hours of discussion with the foundry management of the Lunkenheimer Company of Cincinnati, Ohio, who have fostered bronze-foundry research for nearly fifty years, and especially with Mr. John Bolton, Director of Metallurgical Research and Testing, with whom the Author was most closely associated, and to whom the deepest gratitude is expressed.

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Long-service Awards to Moulders

The firm of John Maddock & Company, Limited. ironfounders, of Oakengates, Salop, presented a number of their old employees with long-service awards at a gathering which took place at the works canteen earlier this month. The presentations, which took the form of inscribed oak-encased Westminster chime clocks, were made by Mr. D. W. Maddock, managing director, to the following: Mr. J. Dabbs, annealer (60 years); Mr. G. Smith, moulder (57 years); Mr. G. Lowe, moulder (56 years); Mr. J. H. Jones annealer (56 years); Mr. E. Oliver, moulder (53 years); Mr. R. Roberts, moulder (53 years); Mr. J. Rushton, moulder (53 years); Mr. E. Withington, moulder (53 years); Mr. B. Pitcheford, moulder (52 years); Mr. J. Ball, moulder (51 years); Mr. C. Parker, pattern maker (57 years), and Mrs Ball, widow of Jos. Ball, moulder (53 years).

In making the presentations Mr. Maddock said the directors were glad to express their appreciation in this way of the services of the men who had stuck to the firm through good and bad times.

Examples of Aluminium-alloy Foundry Practice*

Casting Technique in Relation to Design and Alloy used

By J. Caven and H. W. Keeble, A.I.M.†

SYNOPSIS

The Paper opens with a reference to the rapid development of the aluminium-alloy foundry industry and then proceeds in Part I to outline the basic features of the various production methods normally employed. Part II indicates the more important technical features of aluminium-alloy practice which influence the production of sound castings. In Part III production techniques for certain castings as followed in a foundry organisation serving the open market are described. These techniques describe the way in which jobbing or semi-jobbing quantities may be handled on a self-contained sand-moulding-machine circuit, the production and heat-treatment of large diesel-engine piston castings, making a large paraboloid-shaped casting by the gravity die method, and a special-purpose die-casting made with a sand core.

Introduction

Although aluminium was isolated as a metallic element as late at 1825, at the end of that century it was being used in the un-alloyed condition as a commercial material in the wrought and cast states. Of its use in castings at that time, the "Eros" figure in Piccadilly Circus is perhaps the most well known; this was erected in 1894. With the introduction of the automobile at the turn of the century, the demand for castings in the alloys then developed was such as to establish the aluminium-alloy castings business. Fig. 1 shows a photograph taken of the stand of the Authors' company at the Automobile Show at Crystal Palace in 1903. In 1948 the output of the aluminium-alloy castings industry in this country was 47,000 tons approximately.

The growth of the industry has occurred because of the economic and technical merits of the material, combined with the progressive policies of development which were pursued. To-day, aluminium-alloy castings are produced by all of the recognised methods, in single units or in quantities, of simple and complex designs, in weights up to 35 cwt., to extremely rigorous standards of quality in terms of internal soundness and dimensions. They are used in every conceivable environment.

Before describing the production techniques of certain castings, the features of the production and technical backgrounds are reviewed in order that the principles that these techniques embody may be appreciated.

FIG. 1.—GROUP OF ALUMINIUM-ALLOY CASTINGS ON THE STAND OF THE AUTHORS' COMPANY AT THE AUTOMOBILE SHOW, 1903.

I. PRODUCTION METHODS

Aluminium-alloy castings are produced by all of the various sand-moulding procedures and by gravity-die (permanent mould) and pressure-die methods. These methods account for the great bulk of aluminium-alloy production. The specialised techniques of slush casting, centrifugal casting, vacuum and low pressure procedures and the

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various "precision" methods are used in particular cases.

The important factors which usually decide the method of production are:—

(*a*) Number of castings required, over short- or long-term periods; (*b*) the size, shape and intricacy of design; (*c*) the casting properties of the alloy specified; (*d*) the nature of dimensional tolerances required and subsequent finishing methods; (*e*) permissible expenditure on equipment.

Wood patterns and core-boxes are the least costly of the various types of equipment required, but sand castings required in quantities from this equipment are usually more expensive per piece than either gravity or pressure castings. Therefore, the field for this method of producing is mostly confined to prototypes, castings required in small lots, intricate designs, and castings required in alloys which are unsuitable for permanent-mould casting processes. Where the quantities of castings required range from, say, 100 to 500, with possible repeat orders, and the design is not too intricate, it is worthwhile providing metal pattern equipment suitable for machine moulding. The extra cost of this equipment is more than offset by the increased production and improved dimensional accuracy as compared with that from loose patterns. The fully-mechanised sand foundry is expensively equipped and is in a position to produce, relatively cheaply, high-class castings of a particular character in specified alloys. Unfortunately, repetition lines are few and far between and plants often have to be arranged to meet a semi-repetition throughput.

The modern jobbing foundry, provided with mechanical aids such as a sand-distribution system, a range of moulding machines, individual jib cranes for gangs, augmented by overhead travelling cranes, Sandslingers, casting pit, a liberal supply of roller conveyors and core-blowing equipment, is, therefore, in a position to produce castings in small batches ranging in weight from ounces up to 4,000 lb., and to handle repetition work on a competitive basis. The Sandslinger came into general service in the aluminium foundries during the war years and many factories now prefer this machine, working in conjunction with moulding machines, to the older method of jolting the moulds and the incidental troubles of hard ramming at the base of curved faces, and misplaced chills, riser pegs and loose pieces.

Production of castings as gravity die-castings becomes a worthwhile consideration as soon as quantities required exceed, say, 1,000. The cost of preparing the dies has to be spread over the castings subsequently produced and these costs are heavy, relatively speaking. For this method of production the design and the alloy specified must be suitable. Normally, gravity dies are operated manually, but by applying engineering ingenuity there is a broad field for the application of mechanical aids to facilitate production. Gravity-die assemblies incorporating mechanically-operated die sides, core pulls, ejection plates, etc., operated by pneumatic or hydraulic means, will facilitate production to a considerable extent, particularly if two or three dies can be grouped together to be operated in sequence. Such practice would involve extra initial cost (and designing time), but once the equipment were provided it could be adapted for general use as opportunity occurred.

Producing castings by the pressure die casting method is regulated by the weight and size of the casting, its intricacy and the quantity required. The initial cost of a die is roughly three times that of a gravity die and it is desirable to have in mind quantities of not less than 50,000 when considering this method of production. Standard pressure-casting machines have a casting capacity, including slug and gate, up to about 20 lb. and are suitable for producing castings of even wall-sections not exceeding 0.185 in. thick, and of projected area related to the capacity of the individual machine.

II. TECHNICAL CONSIDERATIONS AFFECTING THE BEHAVIOUR OF ALUMINIUM ALLOYS IN THE FOUNDRY

The chief factors affecting the behaviour of aluminium alloys in the foundry may be enumerated as follow:—

Gas content;
Shrinkage characteristics;
Chemical and physical properties.

Gas Content

Wherever aluminium-alloy castings are made, it is not long before "pinholing" or "gas speckiness" is encountered. Research has indicated that this defect is caused by hydrogen, rejected by the metal during freezing because of a marked decrease in solubility at the solidification temperature. The source of hydrogen is water vapour, which, on contact with molten aluminium, breaks down, forming aluminium oxide and nascent hydrogen which is absorbed by the metal. Apart from the obvious objections to "speckiness" in the castings, there is increased metal wastage in the form of oxide, sullage, etc., which is a dead loss. Hydrogen absorption from the aluminium water-vapour reaction may arise during the melting, in the handling of the molten metal and from the mould itself during pouring. It is of little use to exert extreme care and skill preparing a mould in the best possible condition and then to fill it with metal which might have been prepared at a mineral-water factory. Similarly, to provide a liquid metal, melted and handled under the most carefully-regulated conditions and to pour it into a mould that is satisfactory in every way except for a "wet" runner box, which will cause frothing and gassing of metal, is likewise short-sighted policy.

Hydrogen porosity will show itself when present in thick sections more so than in thin ones, because the rate of solidification is slower and more gas is thrown out of solution. Quite useful information as to the gas content may be gained by "skimming back" the surface of a cooling mass of metal and observing whether there are any small breaks in the surface caused by gas bubbles escaping. This test may be

extended by allowing samples of molten metal to freeze under low absolute pressure. This procedure allows the gas present to expand and more readily to show itself by bursting through the metal surface in sizeable bubbles. This test gives an idea of the gassiness of a melt in a qualitative manner. Fig. 2 shows a

FIG. 2.—WORKSHOP TESTING EQUIPMENT FOR OBSERVING GAS EVOLUTION FROM SOLIDIFYING METAL UNDER REDUCED PRESSURE.

workshop version of this testing equipment, mounted on wheels. It consists of a motor-driven pump connected to a receiver, these being located inside the body of the trolley. On the top there is the motor switch, a vacuum gauge, valve cocks, and an evacuation cylinder fitted with a lid as an inspection window. In use, the trolley is pushed up to the furnace and a dip sample is taken in the small metal crucible which is then placed inside the evacuation cylinder. After replacing the lid the vacuum valve is opened and watch is kept for the extent of gas bubbling as the metal solidifies. In this way, a measure of melt control related to gas content may be practised.

Generally speaking, the presence of hydrogen during solidification of a section, which is adequately fed, is detrimental to the mechanical properties of that section. In the case of section junctions, etc., which are inadequately fed, a gas content may be an apparent advantage in breaking up and dispersing the localised shrinkage which would otherwise occur. It is essential to realise, however, that in so doing, the shrinkage has not been removed but dispersed. The consequences of that dispersal in terms of mechanical strength and pressure tightness, etc., may be less dangerous and obvious than if the shrinkage was still localised. Using a gas content in this way, however, is a negative approach to the problem of soundness which should be attacked from the viewpoint of securing balanced solidification in the direction of the feed reservoirs. These considerations have particular application to gravity-die practice.

To minimise gas absorption, metal temperatures should be held as low as possible, the oxide film on the molten metal should not be broken any more than is necessary (for it appears to act as a sealing), and all possible means whereby water vapour can come into immediate contact with the metal should be excluded. If a melt has an excess gas content, treatment with an organic chloride preparation is as effective a method as any for everyday use. A very effective method where really-low gas contents are believed desirable is to allow the molten metal to stand for extended periods.

Shrinkage Characteristics

The volume shrinkage occurring at solidification coinciding with the release of latent heat is from 6 to 8 per cent. for aluminium alloys. There is one exception, namely, the eutectic silicon alloys for which the value is 3.5 per cent. Unless there is available an adequate reservoir of liquid metal outside the limits of the finished casting, this shrinkage will result in unsoundness. The gating and risering system must always be arranged, as far as possible, to push this shrinkage back to the feeding reservoir and this means creating a temperature gradient towards these reservoirs. The heat content of any liquid metal is a function of specific heat and latent heat. By calculation it can be shown that variations in the heat content to be abstracted are as much as 20 per cent. within the limits of normal pouring temperatures. Hence the insistence on using as low a pouring temperature as is commensurate with proper filling of the mould.

The shape and volume of the risers determine the heat available (in the period required) which controls, partially, how intensively solidification proceeds towards the feed risers. If the runner riser system is not in reasonable balance with the needs of the casting, then it may be found that general solidity is sensitive to variations in pouring temperatures. A temperature higher or lower than the optimum causes either general or local shrinkage unsoundness to varying degree according to the character of the casting and the alloy used.

The mode or habit of solidification is also of importance and is a function of the metallographic constitution of the alloy. In this respect the alloys may be grouped roughly as follow:

(*a*) The eutectic silicon alloys.
(*b*) The binary alloys such as the aluminium/copper and aluminium/magnesium series.
(*c*) Complex alloys containing silicon, copper, iron, manganese, nickel, etc., as alloying elements, represented by alloys such as DTD.133.C and DTD.424.

If test blocks of these alloys be poured it will be found that the "set" will be of the character seen in Fig. 3. This is not all the story, for, while alloys of

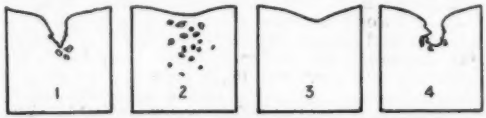

FIG. 3.—DIAGRAMS INDICATING THE SHRINKAGE CHARACTERISTICS OF TEST BLOCKS OF VARIOUS ALLOYS.

(1) Eutectic silicon Alloy—unmodified; (2) eutectic silicon alloy—modified; (3) binary alloys; and (4) complex alloys of the D.T.D. 133c type.

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(*b*) group may appear to be less difficult than the others in respect of gross localised shrinkage, they are liable to a fine form of intercrystalline cavitation for which a carefully-balanced solidification and feed system is required before it may be eradicated. With respect to the eutectic silicon alloys, the effect of modification treatment is seen to be most striking and emphasises the need for careful control of this factor in order that there may be consistent shrinkage behaviour in the foundry.

The extent of the presence of hydrogen will amend the shrinkage habit considerably, as has been indicated, and, with certain alloys like DTD.424, the presence of a sodium content has an effect. Grain size, too, has an appreciable influence. Titanium is used as a grain-refining agent, but there are occasions when it may be present analytically in its specified amount, though it does not appear to function. Some obscure phenomena related to standing time and tranquillity of melt during this period seem, in the Authors' experience, to be operating.

Influence of Chemical and Physical Properties

Because of their low specific gravities, the kinetic energy of a flowing stream of any given aluminium alloy is much less than that of a similar stream of copper-base or ferrous material. Consequently, venting of metal moulds and the permeability of mould and core sands must be such as will allow ready escape of air and gases, otherwise they will enter the metal to form blowholes or cause short running of edges, corners, etc. The hydrostatic pressure per unit depth of aluminium alloys is about one-third that of ferrous materials; this will have its corresponding effect on the mobility of feed metal.

Liquid or solid, aluminium alloys always have a protective oxide film upon them. As rapidly as it is broken, it re-forms and, while it remains unbroken, it will prevent further oxidation. This is important, for where melts are churned about, metal wastage will be high. If a gating system be such that the flow of metal spurts or "waterfalls" into a mould, excessive generation of oxide film will occur which may cause unsoundness. Quiet, tranquil entry of the metal into the mould is a necessity with aluminium alloys if oxide sullage and turbulence defects are to be avoided.

Compared with some other materials, volume for volume, aluminium alloys freeze at a slower rate. This has been related by some workers to the latent-heat values, it being quoted that the values for aluminium and copper are 93 and 50 calories per gramme. When re-expressed in terms of *unit volume* these values become 240 and 445 calories per cubic centimetre, a greatly amended position. From work done by various

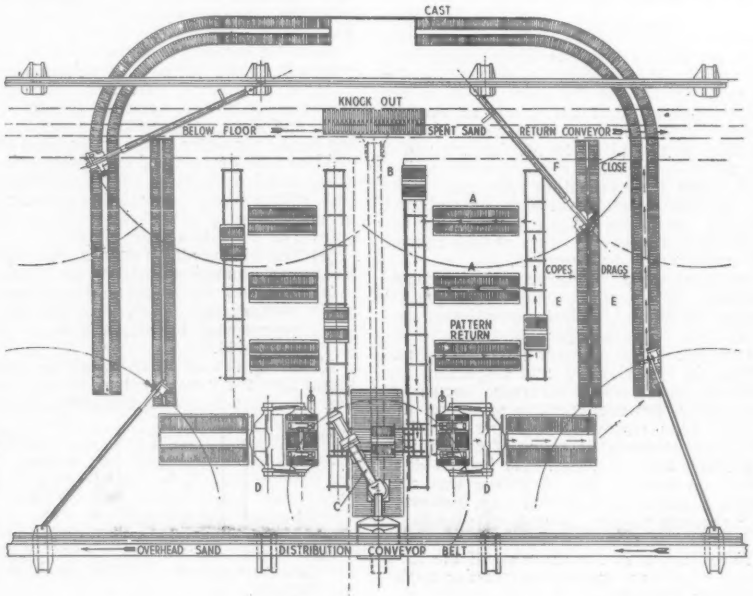

FIG. 4.—LAYOUT OF SELF-CONTAINED FOUNDRY UNIT, UTILISING A SANDSLINGER.

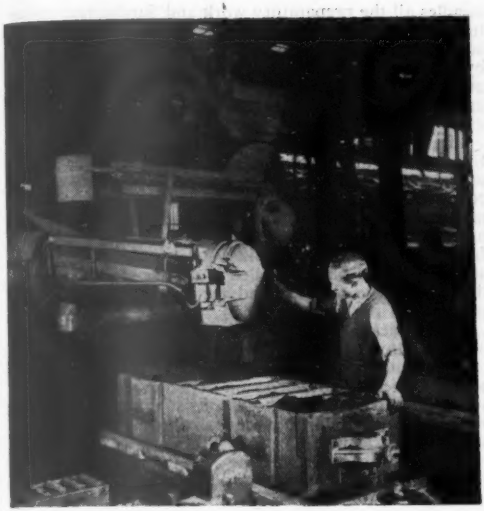

FIG. 5.—SANDSLINGER AT WORK RAMMING A MOULD.

FIG. 6.—ROLLING THE MOULD TO THE TURNOVER MACHINE.

investigators it appears that the thermal conductivity of moulding sands at low temperatures is markedly less than at higher temperatures. Consequently, it seems that aluminium alloys freeze slower because of much

FIG. 7.—TURNOVER MACHINE SHOWING MOULD HELD IN POSITION DURING THE TURNING OPERATION BY AIR-OPERATED CLAMPS.

FIG. 8.—LOWERING THE MOULD FOR PATTERN REMOVAL ON THE TURNOVER MACHINE.

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decreased rate of passage of heat through the mould walls. The practical significance of this is that it aggravates the shrinkage problem, for little self feeding occurs during the pouring of the mould. Furthermore, it gives one explanation as to why the extensive chilling, which is commonly used, is necessary.

III. EXAMPLES OF PRODUCTION TECHNIQUES

Sandslinger and Moulding Machine in Self-contained Circuit

A typical layout of this character is seen in Fig. 4, which shows diagrammatically how the slinger, fed by sand from overhead, is related to the moulding machine, the movement of pattern, the sequence of operations in moulding, core assembly, closing, pouring, knocking-out and the return of boxes, etc., so as to recommence the flow. The sequence of operations is as follow:—

(*a*) Two stations, "A," are designed to permit preparatory work, such as placing chills on the pattern, coating the pattern with facing sand, tucking chills and loose pieces with sand to prevent movement during the filling operation, placing riser pegs in the top part, and positioning the moulding box on the pattern without wasting operational time at either the Sandslinger or the moulding machines.

(*b*) Roller-top bogies, "B," are provided for transporting the prepared pattern and moulding box to the Sandslinger, and thence to the moulding machine.

(*c*) Sandslinger, "C," is arranged with a 10-ft. arm, and is capable of ramming four cwt. of sand per minute; a grid over a conveyor belt takes care of spillage.

(*d*) Two moulding machines, "D," table size 82 in. by 44 in., are arranged with a roller top and a pneumatic clamping device for locking the pattern plate on the table.

(*e*) There is a roller conveyor, "E," for conveying moulds to finishing, core-assembly and casting stations.

(*f*) A jib-crane, "F," with a 20-ft. arm, and of two tons capacity, is available for general handling.

(*g*) A grid over a belt conveyor is used for returning spent sand to the sand-preparation plant.

(*h*) Gas and compressed air is laid-on at suitable points to provide for torch drying and cleaning during mould-finishing operations.

This unit enables the founder to produce castings of a size within the limits of the moulding machines, either as repetition, semi-repetition, or as jobbing work. If it is repetition production, one or more sets of patterns can be in use at station "A" to balance moulding operations. If it is semi-repetition, sets of different patterns can be in use. When producing jobbing work only, any plated patterns can be used, congestion at finishing and pouring stations being avoided by distributing moulds to other parts of the foundry.

The chief points of interest in relation to this method of producing moulds are: Flexibility within the limits of the moulding machines; use of loose pieces in the place of coreprints on a pattern, thereby reducing the cost of finishing and coremaking; an experienced gang handles all the preparatory work and Sandslinger operation; machine turn-over and pattern-draw ensures accuracy of mould form; all movement is catered for by roller conveyor and cranes; and moulds knocked out on site renders box parts, chills and other equipment used at station "A," immediately available for further use.

Fig. 5 shows the Sandslinger working over a box; Fig. 6 shows the box being rolled away from the station on to the machine table to the stops seen between the conveyor tracks. In Fig. 7 the roll-over operation is taking place, the box being held tightly against the stops by pneumatic clamps. The mould being lowered away from the pattern (under vibration) is shown in Fig. 8, after which the plate is rolled back, the clamps holding the pattern are released and the latter then returns to preparation position.

Two typical examples of the wide range of castings made on this type of production unit are:—

(*a*) Volute casing for the Bristol "Hercules" aircraft engine which is produced on repetition lines to pass stringent inspection conditions of soundness and dimensional accuracy (A.I.D. standard) which are required in this class of casting;

(*b*) various castings forming a weather-protection unit for road-making vehicles, etc., produced on semi-jobbing lines but with the plant to work at full capacity

(*To be continued*)

"The Martensitic Transformation"

Dr. Morris Cohen, S.B., Sc.D., Professor of Metallurgy at Massachusetts Institute of Technology, U.S.A., will give a lecture on "The Martensitic Transformation" at the offices of the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1, on July 5, 1949, at 5.30 p.m. Admission will be free on application to the Secretary of the Institute. Dr. Cohen was the Howe Medallist in 1945, received the Sauveur Memorial Award in 1947, and was the Campbell Memorial Lecturer in 1948. He joined the staff of the Massachusetts Institute of Technology in 1936, and held the positions of Instructor, Assistant Professor and Associate Professor before his appointment as Professor of Metallurgy in 1946.

MR. RICHARD OWEN PRITCHARD, who, as announced last week, received the M.B.E. in the Birthday Honours, has spent 50 years in the service of Widnes Foundry and Engineering Company, Limited. He joined the firm as an apprentice and became, successively, moulder, foreman and foundry manager. Since reaching the age of 65, Mr. Pritchard has undertaken special responsibility for molten metal production, and it is as a result of his outstandingly good work over a long period of years, particularly in connection with Ministry of Supply contracts for chemical plant, that the award has been made.

Foundry Industry Development Board

"Little Response from Workers," Says Union Leader

According to Mr. J. Gardner, general secretary of the Amalgamated Union of Foundry Workers, the Development Board set up by the employers in the foundry industry in preparation for the liquidation of the Iron and Steel Board would find little response from the workers, who are not represented on it. Making this point in his annual report to the Union, Mr. Gardner adds that the employers preferred the Board to be exclusive and were not disposed to permit trade-union representation. He continues: "We understand it is fully representative of employers in all sections of the founding industry and its function is to study development in terms of a policy rather than a plan. This in itself makes it of questionable value, either from the standpoint of productivity or of bringing about effective organisation of foundry resources. That the Government should be content to accept advice on such important problems from a body exclusively representative of one side of our industry is to be regretted."

Referring to modernisation and development in the industry, Mr. Gardner said there had been improvements, but they had also brought doubts in the minds of the workers whether modernisation was not being developed at a price of unnecessary dilution and reduced living standards. This was the contradiction inherent in present production relations, and only an approved plan in which the workers shared could remove those doubts.

Nationalisation of Basic Industries

Increasing productivity continued to receive the attention of the Government, employers, and the trade unions, but evidence of enthusiasm at workshop level was not so marked, doubtless due to uneasiness about the future, whether full employment would be maintained and social security become a permanent reality. A comprehensive programme for the nationalisation of our basic industries would have set at rest all doubts about the result of the next General Election.

"The absence of proposals for the nationalisation of our basic industries from 'Labour Believes in Britain,' the draft programme of the Labour Party for the next election, is unrealistic and disappointing to enthusiastic members," Mr. Gardner continues. "It would have corresponded more with the title had the programme given more assurance of a Socialist future for Britain, to be consummated with appropriate urgency, which alone can prevent a worsening of the crisis at the expense of working people."

The annual conference of the Amalgamated Union of Foundry Workers was held at Llandudno last week.

The need for improved conditions in foundries was the main subject at the conference on the Tuesday, when resolutions were passed urging the Executive to continue to press for the implementation of the Garratt report on ironfoundry conditions and for its extension to steel and non-ferrous plants. Members were urged to take more determined action themselves through special campaign committees in each district. Several delegates thought that many employers, particularly among those with small foundries, would do nothing to improve conditions until legislation compelled them to do so. Some delegates said they found factory inspectors helpful, but others expressed the view that the inspectors let employers with bad conditions escape too easily.

At a private session on the following day, delegates passed a resolution, by almost two to one, recommending the Confederation of Shipbuilding and Engineering Unions to take a strike ballot should the employers wholly or partly reject their claims for increased wages. Earlier in the day the delegates, in open session, had endorsed an application by the Confederation for a new minimum consolidated rate, based on the new wages structure.

The conference resolved that all iron and steel undertakings, including all foundries, should come under the nationalisation programme, and that similar treatment should be given to the shipbuilding, ship-repairing, and engineering industries.

State Manufacture of Railway Chairs

Challenge to Private Firms

A further report has been made by the Northern Regional Board for Industry, Newcastle-upon-Tyne, on the proposed expansion in the manufacture of cast-iron railway chairs and base plates at Horwich foundry by British Railways, which has been objected to by private firms. A report of a recent interdepartmental meeting in London stated that the foundry at Horwich would be modernised and would be able to produce chairs at about two-thirds of the price charged by private companies. If the latter by similar methods could reduce their prices, the Railway Executive would in turn consider longer contracts and allow for this in making its plans for the future. It would not, it was stated, be in the interests of the Railway Executive to embark upon further expenditure if the goods were available at competitive prices.

It was denied by British Railways that 1,000 men would become redundant at private firms, and it was stated that the reduction in labour throughout the country was not likely to reach 350 by the time Horwich foundry was ready in about 2½ years' time. The output at Horwich over the next two or three years would have little effect on the cast-iron chair makers' position; about 75,000 tons of chairs per annum would still be needed from private works. Whether this requirement continued depended upon whether the firms would compete with Horwich foundry.

Mr. F. S. Fletcher, chairman of the Tees Advisory Committee, has expressed the opinion that private firms would take up the implied challenge in regard to costs. There are five Tees firms and one on Tyneside making iron railway chairs, and these, along with other companies throughout the country, objected to the plans for Horwich. They contended that eventually other railway plant would be made in State Factories.

News in Brief

SHORT BROS., LIMITED, Sunderland, has received an order for a cargo motorship of 10,000 tons for foreign owners.

GREENOCK DOCKYARD COMPANY, LIMITED, has secured an order for two geared-turbine cargo liners, of 10-11,000 tons dw. each, for the Pacific Steam Navigation Company.

THE COUNCIL of the Institute of Marine Engineers aims to make the Institute's library service the most complete source in this country of information on marine engineering.

THE TELEPHONE NUMBER of the A.P.V. Company, Limited, Wandsworth Park, London, S.W.18, is now Vandyke 4492-9, while the telegraphic address has been changed to Anaclastic, Wesphone, London.

WEIGHING 165 LB. PER FT., a broad-flange beam, 24 in. by 12 in., claimed to be the largest and heaviest ever produced in this country, has been manufactured by the Cargo Fleet Iron Company, Limited, Middlesbrough.

THE WORKS OF James C. Waterhouse, Limited, crucible and plumbago manufacturers, of Wakefield, Yorks, will be closed for holidays from August 6-13, during which period no goods will be despatched or received.

THE ANNUAL REPORT of the Comptroller-General of Patents, Designs and Trade Marks shows that patents applications last year totalled 33,626 and 15,558 were sealed. Trade marks applications totalled 10,326 and the number registered was 7,397.

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Glasgow, has secured orders from the Tharsis Sulphur & Copper Company, Limited, Glasgow, the Sudan Government, and the African Benguela Railways for a total of 20 locomotives, valued at about £400,000.

HEAD, WRIGHTSON & COMPANY, LIMITED, Thornaby-on-Tees, recently embarked upon light aluminium construction and, through the medium of its subsidiary, Head, Wrightson (Aldean), Limited, it now has orders in hand of a total value approaching £1,000,000.

GENERAL CABLE MANUFACTURING COMPANY, LIMITED, Leatherhead, Surrey, proposes to make a capital bonus of two new shares for every three held. The issue will require 200,000 5s. ordinary shares, and approval is accordingly being sought to the capitalisation of £50,000 of the general reserve.

THE REPORT of the directors of Baker Perkins, Limited, manufacturing engineers, etc., of Peterborough, draws attention to the fact that the bank loan in the new balance-sheet (dated December 28, 1948) stood at £990,650; consideration is being given to the making of a new issue of capital.

AN INCREASE is proposed in the authorised capital of J. Stone & Company, Limited, general marine and railway engineers, etc., of Deptford, London, S.E.14, by the creation of 600,400 £1 "A" ordinary shares. The new shares will be issued as a capital bonus on the basis of one new share for each £1 ordinary unit held.

APPLICATION IS TO BE MADE in the near future to the Council of the London Stock Exchange for permission to deal in the 150,000 5½ per cent. redeemable cumulative preference £1 shares of International Combustion Africa, Limited, which were recently offered for subscription in South Africa at 20s. 6d. a share.

IN HIS REPORT circulated with the accounts, Mr. A. W. Eva, chairman of Eva Bros., Limited, forgemasters, of Manchester, states that the directors are examining the advisability of making a bonus issue. This, the chairman says, would "secure the actual capital in the business and remove a misinterpretation of the apparent high rate of dividend."

THE INNER DOME of the Royal Albert Hall, London, which is being reconstructed, will be made of aluminium instead of glass, and will comprise a main frame and two skins, the lower being perforated and backed with rock wool. It is expected that this will provide much more efficient heat insulation and sound absorption than the former glass dome.

THE APPLEBY-FRODINGHAM BRANCH of the United Steel Companies, Limited, has announced that in the four weeks ended June 4 its rolling mills added 1,208 tons to the previous record output of 24,612 tons, established in March. The melting shop produced 19,428 tons of steel, an increase of 157 tons on the previous best output, recorded in February.

"IN ORDER to compensate shareholders in some measure for the limitation of dividends imposed in times of prosperity, some provision ought to be made by way of reserve for the lean years which, it would seem, are now approaching us," says Mr. G. A. L. Hatton, chairman of Chamberlin & Hill, Limited, ironfounders, of Walsall, in the company's annual report. "It is therefore proposed to allocate £10,000 to the dividend equalisation reserve which will make a total of £15,000, representing three years' dividends at the present rate of distribution."

BABCOCK & WILCOX, LIMITED, boilermakers, etc., of Renfrew, is convening an extra-ordinary meeting for July 5 to increase the nominal capital of the company to £8,800,000 by the creation of 3 million new 4 per cent. cumulative redeemable preference £1 shares and 1,180,000 new ordinary £1 shares. Approval of the Treasury has been received to the issue of 2 million new preference shares for subscription by the holders of both preference and ordinary stock registered June 20, and to the offer of 716,609 new ordinary shares by way of rights to the holders of ordinary stock registered at the same date.

REFERRING TO HIS announcement last year of the intention to go ahead with such parts of the new blast-furnace scheme at Gartsherrie as were required in replacement of portions of the existing plant, Mr. A. K. McCosh, chairman, at last week's meeting in Glasgow of Bairds & Scottish Steel, Limited, said that, subsequently, authority would have been sought to proceed somewhat further than that by building one new furnace and a new battery of coke ovens. In view of the terms of the Bill for the nationalisation of the iron and steel industry, however, the board felt that it was not justified in undertaking any part of the work meantime and so notified the Steel Board.

METROPOLITAN GAS METERS, LIMITED, Nottingham, is to make an issue of 25,000 5 per cent. £1 cumulative redeemable preference shares for immediate Private

subscription. It is also proposed to create £15,000 additional ordinary capital in 2s. shares and to subdivide the existing 10s. shares into 2s. shares. There is no immediate intention, it is stated, of issuing the new ordinary shares.

SPACE AT THE Salon International des Industries Maritimes et Fluviales (shipping and marine engineering exhibition), which is being held in Paris in October, is being taken by many firms outside France, as well as French exhibitors. The exhibition is to be on a much larger scale this year. Details may be obtained from the offices of the exhibition, 8, Rue Jean-Goujon, Paris VII.

ADDRESSING CARDIFF ROTARY CLUB recently, Mr. N. R. R. Brooke, a director and general manager of Guest, Keen & Nettlefolds, Limited, described the rolling-mill and wire-drawing and nail-manufacturing machinery at Cardiff as the finest of its kind in the world. When the new wire-rod mill is put into operation next year, it will operate at a higher speed than any other in the world, he said.

A SPECIAL SUB-COMMITTEE, appointed by the Northern Regional Board for Industry, is considering the possibility of manufacturing petrol equipment as an alternative in the event of a recession in shipbuilding in the North. Sir Mark Hodgson, chairman of the subcommittee, has stated that the Council of the British Manufacturers of Petroleum Equipment has expressed interest in the region's resources.

RECENT MAJOR BUILDING and reconstruction schemes approved in the Sheffield district by the Ministry of Supply include repairs to the light engineering shop of Samuel Fox & Company, Limited, steel manufacturers, extensions to the premises of Hardypick, Limited, manufacturers of mining tools, etc., repairs to the works of Thos. Firth & John Brown, Limited, steelmakers, and extensions to the machine shop of Hadfields, Limited.

SCOTTISH MANUFACTURERS of sugar machinery, who last year produced equipment valued at £1,750,000, most of it for export, are concerned at the loss of orders to foreign competitors through currency difficulties. The principal effect is felt in Mauritius, one of Scotland's best customers during the last 20 years. The British Empire Sugar Machinery Association is stated to have approached the Secretary of State for the Colonies about the currency problem.

THE DIRECTORS OF H. J. Baldwin & Company, Limited, earthenware cable cover and clay goods manufacturers, of Nottingham, propose to increase the authorised capital of the company to £250,000 by creating 50,000 6 per cent. £1 cumulative preference shares and 500,000 2s. ordinary shares. The preference shares will be offered to existing preference holders in the ratio of one for one at 25s., and ordinary shareholders will be offered 200,000 of the new ordinary at 6s. each in the ratio of one for five.

G. N. HADEN & SONS, LIMITED, heating and electrical engineers, of Trowbridge, Wilts, proposes to increase its authorised capital to £750,000 by the creation of 350,000 5 per cent. cumulative preference £1 shares and 700,000 ordinary 5s. shares. Then 250,000 of the 5 per cent. preference shares are to be issued for cash and £152,865 of the general reserve is to be capitalised by the allotment as a scrip bonus of one new share for every ordinary share held at the close of business last Friday. Treasury consent has been obtained to the issues.

A SURVEY, recently undertaken at the suggestion of a sub-committee of the Industrial Health Advisory Committee of the Minister of Labour, has shown that of 243,769 factories in Great Britain, only 4,499 have definite arrangements for medical services (other than statutory examinations of young persons). A list of industries which predominantly stand out as having factories with arrangements for medical supervision beyond legally compulsory medical examinations includes the shipbuilding, iron and steel, metal-tube and chemicals industries.

AN INCREASE in the capital of the Telephone Manufacturing Company, Limited, West Dulwich, London, S.E.21, to £1,000,000 by the creation of 2,000,000 5s. ordinary shares and the adoption of new articles will be proposed at an extra-ordinary general meeting of the company on July 4. There is "no intention of making any further issue of capital at present." One effect of the new articles will be to withdraw the company's right in general meeting to direct that any new shares shall be offered to existing members in proportion to their holdings.

SPEAKING AT SOUTHAMPTON, Mr. Anthony Eden, who reiterated the Conservatives' intent to denationalise the steel industry if it had been nationalised by the date of the General Election and a Tory Government was returned to power, also stated that a Conservative Government would call a halt to further schemes of nationalisation. "Where it is not practicable to denationalise, we shall decentralise," he said. "We shall not denationalise the coal industry or the railways, but it does not mean that we shall not do anything to improve their present operation."

Howard & Bullough's Reduced Dividend

In a statement circulated with the accounts of Howard & Bullough (Securities), Limited, the Accrington (Lancs) textile-machinery concern, Mr. J. Redman, the chairman, says that the incursion into the dividend and other reserves over the past four years amounts in all to £20,000, and as this money was invested, stockholders will realise that the maintenance or increase of income from investments is made more difficult each time the reserve is reduced. Moreover, the prospects of increased dividends from the merger company are not so certain as one would like, because of the Chancellor's remarks as to possible legislation upon dividend limitation. Mr. Redman says that the directors feel, therefore, that the issue of paying dividends from annual income should now be faced, and they are reluctantly compelled to recommend that the dividend be reduced to 4½ per cent.

Two special resolutions will be proposed at a meeting on June 30, the first to alter provisions of memorandum of association of the company so as to make the business of an investment company one of its principal objects. The second provides for alterations to articles to cover some of the more important changes brought about by the Companies Act, 1948.

Personal

SIR JOHN FORBES WATSON, director of the British Employers' Confederation, has been elected chairman of the International Labour Conference employers' group.

MR. DONALD MCCULLOUGH has been appointed public relations adviser to the Federation of British Industries. The appointment will not prevent his continuing to hold his existing directorships.

DR. A. POPE, lecturer in engineering at Sheffield University, has been appointed to the Chair of Engineering in the University of Nottingham. In 1946 Dr. Pope was awarded the George Stephenson prize of the Institute of Civil and Mechanical Engineers for research work on mild steel.

MR. E. J. HILL, general secretary of the United Society of Boilermakers and Iron and Steel Shipbuilders, has been elected chairman of the Shipbuilding Negotiating Committee of the Confederation of Shipbuilding and Engineering Unions. He succeeds SIR JOHN STEPHENSON, who is relinquishing his trade-union appointments to undertake the direction of the Eastern Regional Gas Board.

MR. GEOFFREY C. R. ELEY has been appointed chairman and SIR GEORGE CUFFE managing director of Richard Crittall & Company, Limited, and its subsidiaries. The reconstruction of the company was completed on June 9, when Mr. R. G. Leach, appointed receiver and manager on August 19, 1948, was discharged and Mr. H. Victor Cozens, chairman during the reconstruction, and other directors resigned. The three technical directors, MR. J. P. HAMILL, MR. W. R. COX and MR. G. F. WATTEARS, retain their seats on the board.

MR. P. A. SANDERS has been appointed deputy chairman of Davey, Paxman & Company, Limited, engineers, of Colchester. The directors have elected SIR JOHN B. GREAVES to the board and he has been appointed managing director in succession to the late Mr. Edward Paxman. Sir John, who is a director of Ruston & Hornsby, Limited, Lincoln, has had a long business career in India. MR. G. W. BONE, only son of Mr. V. W. Bone, has been appointed works director of Davey, Paxman & Company. The resignation of MR. V. W. BONE from the board of Ruston & Hornsby, Limited, was reported in our issue of June 2 last, when it was also announced that he would be succeeded as chairman by MR. J. H. W. PAWLYN and as managing director by MR. H. RIGGALL.

ONE OF THE FOUR MAIN EXHIBITIONS in connection with the Festival of Britain, 1951, will be held in Scotland—a "thematic" exhibition of heavy engineering and shipbuilding in the Kelvin Hall, Glasgow, the object of which will be to tell the story of Britain's progress in heavy engineering and shipbuilding. It will include exhibits from manufacturers and items ranging from Stephenson's "Rocket" to models of the latest locomotives, and from the Charlotte Dundas to the Queen Mary. A "floating exhibition" which will be a miniature version of the main exhibition and which, it is hoped, will spend 12 days each in a port on the West and East of Scotland, is also being planned.

Formation of Dollar Exports Board

Promoting Trade With North America

The formation of the Dollar Exports Board was announced in London on June 13 by Sir Graham Cunningham, the chairman. The members of the Council are as follow:—Mr. E. A. Carpenter, president of the Manchester Chamber of Commerce; Mr. C. B. Colston, chairman and managing director of Hoover, Limited; Sir Charles Hambro, a director of the Bank of England and chairman of the Financial Advisory Committee on dollar exports; Sir Patrick Hannon, M.P., president of the National Union of Manufacturers; Mr. Laurence Heyworth, a director of Lever Bros. & Unilever, Limited; Sir Percy Lister, chairman of R. A. Lister & Company, Limited; Mr. John McLean, president of the Associated British Chambers of Commerce; Sir Leonard Paton, a director of Harrisons & Crosfield, Limited; Sir Robert Sinclair, president of the Federation of British Industries; and Mr. H. V. Tewson, general secretary of the Trades Union Congress.

An Imperative Need

The purpose of the Board is to promote and assist in every way the increase of British exports to North America. Sir Graham Cunningham said that the need for British exports into the dollar countries was so imperative that their increase was not merely a question of patriotism but a matter of self-preservation. The Board hoped that it would be able to help in removing obstacles raised in the way of increased British exports by the actions of governments, and also to encourage individual industries and manufacturers to tackle what were undoubtedly difficult markets. It would welcome suggestions from any quarter, and would develop its policy and activities in the light of experience.

The Board has been formed into a company limited by guarantee, and Sir Graham Cunningham emphasised that it is not a Government department, although enjoying full support and all possible assistance from the Government departments concerned. It had been formed, he said, entirely by British industry, commerce, finance, and organised labour, and the Council of the Board included representatives of all of these sections of the country's economic life.

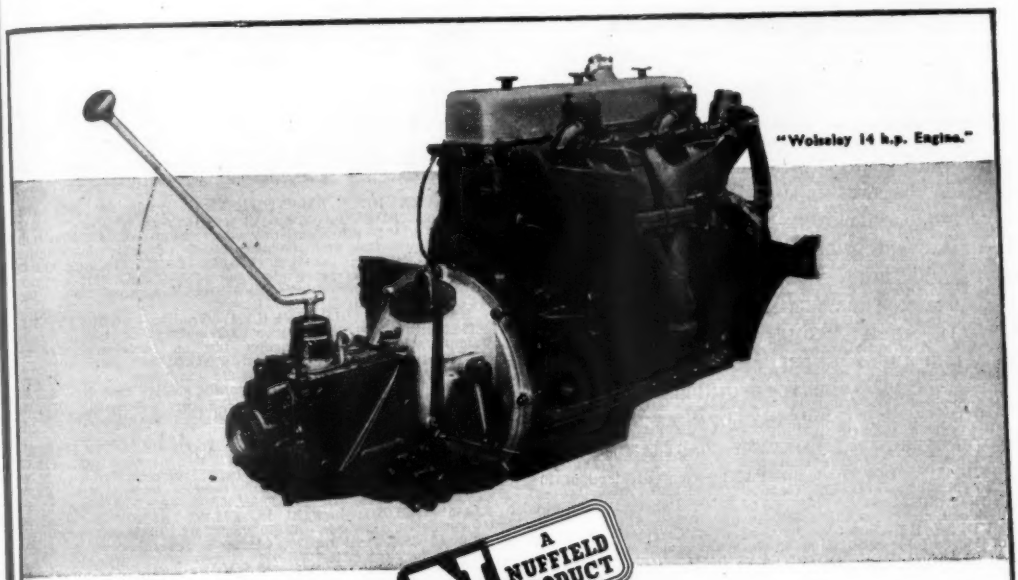
Sir Graham stated that the Board was being financed by industry, and all members of the Council of the Board and of the Financial Advisory Committee were giving their services.

Gazette

ALUMINIUM & ALLOYS, LIMITED, is being wound up voluntarily. Mr. B. C. Saphir, 11, Upper Grosvenor Street, London, W.1, is the liquidator.

BILLINGTONS BOSTON FOUNDRY, LIMITED, is being wound up voluntarily. Mr. P. J. Snow, 17, Albion Street, Hanley, Stoke-on-Trent, is the liquidator.

DEVONPORT ENGINEERING COMPANY (DAVID SALE), LIMITED, is being wound up voluntarily. Mr. H. A. Snell, 7, Unity Street, College Green, Bristol, 1, is the liquidator. (All debts have been or will be paid in full.)



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Company News

(Figures for previous year in brackets.)

HICKMAN—Dividend of 12½% (nil).
TILLING-STEVENS—Dividend of 7½% (5%).
WHESSOE—Final dividend of 30%, making 40% (same).
GLACIER METAL COMPANY—Dividend of 7½% (same).
GEO. ADLAM & SONS—Final dividend of 37½%, making 50% (same).
BENTLEY ENGINEERING COMPANY—Dividend of 40% (same).
COLEY METALS—Dividend of 10% and bonus of 2½% (same).
WARD & GOLDSTONE—Final dividend of 30%, making 50% (same).
BRECKNELL, MUNRO & ROGERS—Interim dividend of 15% (same).
N. GREENING & SONS—Final dividend of 12½%, making 17½% (same).
WEYBURN ENGINEERING COMPANY—Interim dividend of 5% (same).
JOHN HARPER & COMPANY—Second interim dividend of making 20% (same).
ALLIED IRONFOUNDERS—Final dividend of 10% (12½%), making 17½% (same).
RAILWAY & GENERAL ENGINEERING COMPANY—Dividend of 8¾% (7½%).
SHIP CARBON COMPANY OF GREAT BRITAIN—Dividend of 15% (10%).
JOHN BROWN & COMPANY—Final dividend of 9¼%, making 12½%, tax free (same).
THOMAS LOCKER & COMPANY—Final dividend of 10%, 20% (22½%), making 30% (same).
BRITISH INSULATED CALLENDER'S CABLES—Final dividend of 4¾%, making 6¾% (same).
KEITH BLACKMAN—Dividend of 20% (same) and bonus of 5% (nil) in celebration of the 60th annual meeting.
CLIMAX ROCK DRILL & ENGINEERING WORKS—Final dividend of 5% (7½%), making 10% (12½%).
UNION STEEL & MANUFACTURING COMPANY—Dividend of 27½%. The company was made public on April 30, 1948.
HARRISON, McGREGOR & GUEST—Dividends on the preference shares due July 1, 1948, and January 1, 1949, remain unpaid.
THOS. FIRTH & JOHN BROWN—Final dividend of 10% (7½%), making 12½%, tax free, for 15 months (10%, tax free, for 12 months).
WILLIAM DIBBEN & SONS—Final dividend of 10% on increased capital, making 15%. Last year a single payment of 15% was made.
ENGINEERING & LIGHTING EQUIPMENT COMPANY—No dividend is being paid on the 7% preference shares, which are in arrears from June 30, 1946.
JAMES STOTT & COMPANY (ENGINEERS)—Trading profit, etc., to February 28, £107,488; net profit, £43,801; to reserve, £119,000; dividend, less tax, £15,015; forward, £18,759.
R.F.D. COMPANY—Trading profit for 1948, £12,317 (£18.594); other income, £578 (£549); net loss, after expenses, depreciation, etc., £1.865 (net profit £5,730); tax recoverable, nil (£2.000); dividend, nil (8%); forward, £5,937 (£7,802).
CHAMBERLIN & HILL—Net profit, after tax, £24,281 (£21,821); final dividend of 20%, making 30% (same); to general reserve, £7,500 (£5,000); reconstruction and development fund, nil (£9,000); dividend equalisation fund, £10,000 (nil); forward, £17.891 (£16,560).
OZONAIR—Trading profit for 1948, £10.443 (£9,057); net profit, after directors' emoluments, etc., but before tax, £4,140 (£3,284); income tax recovered by deduction from 1947 final dividends, £348 (nil); to taxation, £1,350 (£1,100); reserve for future tax, nil (£450); general reserve, £1,000 (nil); dividend of 8¼% on increased capital; forward, £3,529 (£3,057).
VERITYS—Trading profit in 1948, £42,705; to auditors' remuneration, £368; depreciation, £11,750 (£10,000); loss on sale of fixed assets, £330; tax, £16,568 (£8,000); leaving £13,689 (£21,725, including £15,341 relating to previous years and £10.000 from contingencies); brought in, £13.194 (£6.419); available, £26,883 (£28,144); to general reserve, £5,000 (£10.000); dividend of 5% (same); forward, £16,933.
HOWARD & BULLOUGH (SECURITIES)—Dividend, etc., revenue to March 31, £71,866 (£71,020); to income tax, £31,435 (£30,987); profits tax, £199 (£1,030); directors' emoluments, £1,500 (same); leaving £38,732 (£37,503); brought in, £933 (£933); premium on redemption of Norwegian bonds, nil (£1,770); from dividend reserve, nil (£3,000); available, £39,333 (£43,206); dividend of 4½% (5%), £30,937 (£34,375); forward, £126.
METAL PRODUCTS—Net profit for 11 months to March 31, including dividends from subsidiary companies and after providing for taxation, £11,008; to preference dividends, £2,923; final ordinary dividend of 5%, making 7½% for the period, £3,656; forward, £4,429. The directors propose to write off preliminary and issue expenses £7,929 against share premium account of £9,195, reducing the latter account to £1,266.
CRAVEN BROS. (MANCHESTER)—Profit for 1948, after charging £11,965 working directors' remuneration, £85,924 (£55,626); tax provision no longer required, £25,000 (nil); to bank interest and charges, £1,645 (£1,250); depreciation, £20,000 (£15,000); taxation, £30,000 (£8,000); leaving £59,279 (£31,376); to preference dividend, £5,500 (£4,125); ordinary dividend of 10%, making 15% (same); directors' fees, £1,800 (£2,100); forward, £212,136 (£184,907).
HARRISON (BIRMINGHAM)—Trading profit for 1948, £275,552; interest, £11,429; to depreciation, £23,481; directors' remuneration, £22,268; income tax on investment income, £4,740; profits and income tax, £120,137; net profit, £115,355; casual profits, £142; dividend of 25%, tax free (same); general reserve, £35,000 (£15,000); metal stock reserve, £13,350 (£20,000); pensions, £5,917 (£25,000); forward, £162,920 (£148,715 brought in, after adjustment taxation for earlier period).
EVA BROS.—Trading profits to March 31, £60,596 (£68,621); to surplus on assets sold, nil (£520); depreciation, £10,539 (£8,580); obsolescence, £1,126 (nil); directors' fees, £1,000 (same); management, £4,000 (same); profits tax, £8,500 (£9,200); income tax 1949-50, £16,500 (£21,300); net profit, £18,931 (£25,061); brought in, £15,722 (£8,267); dividend on 6% preference shares, £2,310 (£2,173); final ordinary dividend of 35%, making 70% (same); general reserve, £5,000 (same); forward, £16,910.
JURY HOLLOWARE (STEVENS)—Trading profit to March 31, £54,146 (£86,605); interest, £218 (£277); to depreciation, £6,776 (£6,429); auditors' remuneration, £500 (same); staff superannuation, £1,732 (£1,607); directors' remuneration, £7,893 (£11,814); leaving £37.463 (£66.532); stock reserve no longer required, £5,000 (£22,900); brought in, £30,044; making £72,507 (£89,432); to tax, £24,084 (£36,738); dividend of 10% (same); general reserve, nil (£10,000); replacements reserve, £10.000 (nil); forward, £25,773.
MINIMAX—Consolidated trading profit for 1948, including sundry revenue, £183,794 (£110.731); to patent fees, £441 (£232); directors' emoluments, £25,404 (£16,466); audit fees, £160 (same); depreciation, £6.237 (£3.123); U.K. profits tax, £19,018 (£15.017); leaving £132,534 (£75,733); to reserve for income tax, £53.066 (£34,080); net profit, £79,468 (£41,653); final dividend of 12% and bonus of 5%, making 25% (same); written off patents, £675 (£420); reserve, £25,000 (nil); staff retiring allowances, £33,196 (£9,147); forward, £67.515.
ALEXANDER, FERGUSSON & COMPANY—Consolidated trading profit and other income for 1948, £77.511; investment income, £3.248; to loan interest, £1,030; depreciation, £9.864; taxation, £35.836; net profit, £34,029; special non-recurring profit, £57.231; net provisions not required, £9,802; brought in, £57.033; available balance, £158.095; to general reserve, £72.020; sinking fund, £1,220; preference dividend, £1.925; ordinary dividend of 24%, tax free, £16.800 (same); profits of subsidiary company vesting in minority, £2,677; forward, £63.453.
AMBROSE SHARDLOW & COMPANY—Trading profit for the year ended March 31, £196.878 (£229.568), including investment income £6.326 (£15,459) and after depreciation £42.874 (£35 474), directors' emoluments £18.190 (£17.289), loan interest £926 (£1.087), audit fee £450 (£700), and loss on sale of plant £1.371 (£352); to tax, £90,314 (£95.251); net profit, £106.564 (£134,317); adjustment to value of work in progress, £66.000 (nil); to stock reserve, £66,000 (nil); replacement of fixed assets, £50,000 (£60,000); general reserve, £30.000 (£50.000); dividend of 12½% (same); forward, £30,290 (£22.976).
EWART HOLDINGS (formerly Ewart & Son)—Consolidated income in 1948 from investments, £553 (£954); to trading loss, £4.358 (profit £1.808); depreciation, £8,866 (£5.713); auditors' remuneration, £286 (£274); reorganisation expenses, £652 (£1.000); loss on sale of investments, £1,270; tax, £684 (£1.601); net loss, £15.563 (loss £13,484); after bringing in reserves and undistributed subsidiary profits of £2,696 (£910

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holding company's proportion of subsidiary losses) the debit forward is £12,867. The loss on trading is considered by the directors to be attributable to the continued incidence of purchase tax on Ewart & Sons' main products.

G. N. HADEN & SONS—Consolidated profit for 1948, £161,646 (£62,873); to depreciation, £5,848 (£3,866); directors' emoluments, £20,765 (£20,817); auditors' remuneration, £576 (same); leaving £134,457 (£37,614); investment income, £3,199 (£1,386); to taxation, £68,141 (£25,391); proportion profits applicable to outside shareholders, £441 (£271); parent company's profit, £153,239 (£57,708); to depreciation, £5,516 (£3,715); directors' emoluments, £20,765 (£20,817); auditors' remuneration, £420 (same); leaving £126,538 (£32,756); other income, £5,599 (£3,761); to taxation, £65,665 (£24,000); off investment, £15,000 (nil); dividend of 25% (same); forward, consolidated £175,527 (£143,669), parent company £159,834 (£130,578).

TELEPHONE MANUFACTURING COMPANY—Consolidated trading profit for 1948, £281,529; investments income, £258; to directors' remuneration, £31,141; fees, £1,400; audit fees, £666; depreciation, £19,926; leaving £228,654; to profits tax, £31,179; income tax, £90,174; further tax provisions, less adjustments, £7,115; contingencies, £35,000; leaving £65,186; parent company's balance, £63,914 (debit £24,864); brought in, £9,383 (£9,059); subsidiaries' dividends respect previous years, nil (£3,427); Government contract to December 31, 1946, final settlement, nil (£57,242); reserve of former subsidiary written back, £1,100 (nil); available, £73,677 (£44,864); to general reserve, £10,000 (£10,731); final dividend of 6½%, making 9% (same); forward, £38,927.

CONSETT IRON COMPANY—Trading profit for the year to March 31, £1,227,810 (adjusted £945,954); interim income for nine months to December 31 receivable under Coal Industry Nationalisation Act, interest and transfer fees, £175,661 (£290,518); income from trade investments, £2,632 (£2,662); income other investments, £1,804 (£2,246); dividend from subsidiary, nil (£54,600); to directors' fees, £8,000 (same) (fees from other companies as nominees of company £300, other emoluments £13,872 and pensions £4,750); debenture interest £45,251 (£47,096); depreciation, £350,000 (£225,000); taxation, £523,000 (£520,000); net profit, £481,656 (£495,884); provisions not required, £114,044 (£170,000); to debenture sinking fund, £5,134 (£42,657); plant improvement and extensions reserve, £400,000 (same); dividend of 12½% (same); forward, £225,185.

BAKER PERKINS—Consolidated profit to December 28, 1948, £1,062,118 (adjusted £847,833); to provisions for liabilities on sales under guarantees, £42,193 (£23,264); investments income, £28,264 (£26,149); interest on marketable securities, £1,201 (£851); other interest, £5,952 (£5,438); to directors' fees, £3,738 (£3,812); depreciation, £185,323 (£128,072); off leasehold property expenditure, £8,202 (£27,445); interest, £47,426 (£33,640); provision for losses of a subsidiary not consolidated, nil (£49,628); income tax, £183,111 (£110,130); profits tax, £59,750 (£44,520); foreign and Dominion taxes, £172,078 (£165,543)—less £7,673 tax adjustments—leaving £403,387 (£294,217); to subsidiary profits attributable to minority interests, £98,906 (£82,998); parent company's balance, £136,149 (£101,752); brought in, £285,045 (£214,696); tax recovered from dividend paid in 1947, nil (£27,856); available, £421,194 (£344,304); to pension, £5,000 (same); preference dividends, £16,170 (£20,212); ordinary distribution, £37,695 (£34,047); forward, £362,329.

J. STONE & COMPANY—Consolidated trading balance for 1948—less profit attributable to minority interest, £1,061—£870,347 (£503,151); investment income, £26,344 (£28,312 plus £29,618 profit on sales of investments and £15,564 profit on matured sinking fund policies); to depreciation, £105,977 (£125,363); audit fees, £2,517 (£1,728); war damage expenditure, partly recoverable, £24,118 (£4,663); taxation, £411,483 (£265,383); net profit, £352,596 (£179,508); recovery of war damage expenditure previously written off, £18,400 (£27,198); to contingency reserve, £23,169 (£77,198); parent's trading balance, £695,362 (£528,466); investment income, £51,893 (£49,502 plus £16,267 capital dividend from subsidiary, £13,351 profit on sale of investment and £15,564 profit on matured sinking fund policies); to directors' emoluments, £45,629 (£38,287); audit fee, £945 (same); war damage expenditure, partly recoverable, £24,118 (£4,663); depreciation, £77,280 (£110,397); taxation, £345,000 (£250,000); net profit, £254,283 (£218,858); recovery of war damage and other expenditure previously written off, £18,400 (£27,198, plus £50,000 income tax provision no longer required); to general reserve, £50,000 (£50,400); contingency reserve, £18,400 (£77,198); reserve towards cost of replacement of fixed assets, £100,000 (nil); dividend of 15%, making 25% (same); forward, consolidated £550,908 (£457,086), parent £411,174 (£410,896).

Obituary

MR. GEORGE B. JOHNSTON, of the Glasgow branch of the Simplex Electric Company, Limited, died on June 10.

MR. WILLIAM R. TIMKEN, the last of three founders of the Timken Roller Bearing Company, Ohio, has died at the age of 84.

MR. BERTRAM ADAMSON, who died on June 3, was representative for over 35 years of the Leeds Meter Company, Limited.

MR. WILLIAM HENRY DUNCAN, late secretary of Walter Macfarlane & Company, Limited, architectural and sanitary ironfounders, of Glasgow, died on June 8.

MAJOR DESMOND GEORGE CAVANAGH MURPHY, former sales manager of the Cardiff branch of the British Thomson-Houston Company, Limited, died recently.

MR. THOMAS JONES, who had been for over 50 years with the steel-rolling department of the Lilleshall Company, Limited, Shifnal, Shrops, died recently. He was 73.

MR. LIONEL RICHARD CLAYTON, who had been with the Metropolitan-Vickers Electrical Company, Limited, Manchester, for 43 years, died suddenly on June 12. He was 58.

MR. R. CARLTON TAYLOR, managing director of Taylor & Jones, Limited, manufacturers of engineers' tools, etc., of Honley, Huddersfield, died on June 10 after a short illness. He was 53.

MR. WILLIAM HAROLD BOOTH, iron and brass founder, of Rotherham, died on June 11 at the age of 77. He was formerly connected for about 30 years with Yates, Haywood & Company, ironfounders, of Rotherham.

MR. ROBERT ERNEST GALE, manager of the high-frequency and instrument sections at the works in Aboyne Road, Tooting, London, of Philips Electrical, Limited, has died at the early age of 47. He joined the company's staff 20 years ago.

MR. THOMAS SMITH CURTIS, who died in a London nursing home on June 11, was a director of Invicta Foil & Cheswright & Nicholls, Limited, lead-washer and collapsible-tube manufacturers, of Barking, Essex, and other companies. He was 92.

MR. JOHN FREDERICK BYERS, the prominent American banker, died on June 11 in hospital in New York at the age of 67. Besides his banking interests, Mr. Byers was a director of the Westinghouse Air Brake Company, the Union Switch & Signal Company, and the Western Alleghany Railroad Company.

MR. JOSEPH EDWIN THORNTON, works manager of Hall & Pickles, Limited, steel and tool manufacturers, etc., of Sheffield, died recently after a long illness. He was 49. Mr. Thornton previously worked at Brown Bayley's Steel Works, Limited, Sheffield, and was for many years personal assistant to Mr. Harry Brearley, the discoverer of stainless steel.

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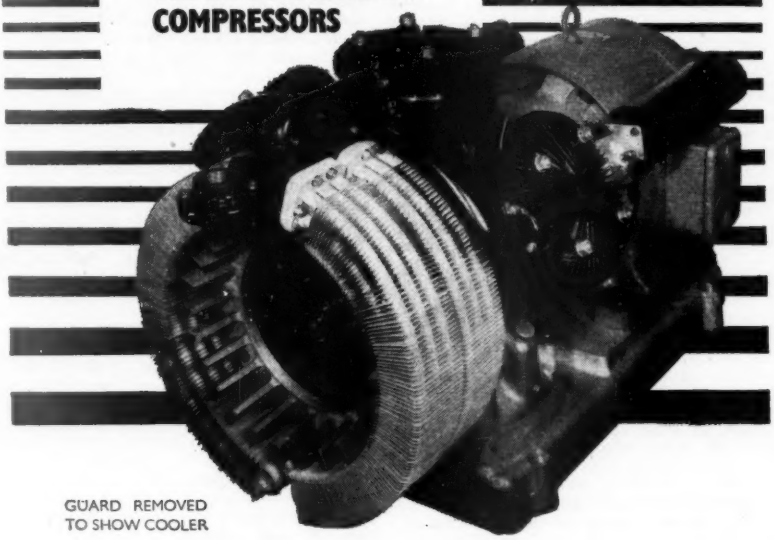

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Raw Material Markets

Iron and Steel

The pig-iron market is active and still greater activity portends as bigger supplies become available. For a few months deliveries have been restricted because several blast furnaces were laid idle for relining. Now output has been restored, allocations have been brought into line with current requirements, and consumers may be able to raise their stocks to normal proportions. There is no hint of recession in the foundry trades. Both the heavy engineering establishments and the makers of light castings are busy and the one dark cloud on the horizon is the further increase in the price of foundry coke which, at a most inopportune time, must have an inflationary effect on the price of castings.

Home production of billets, sheet bars and slabs still falls substantially short of the overall requirements of the re-rolling mills, and imports on a considerable scale are still required to bridge the gap. Substantial shipments of Continental material, however, are now coming to hand and other consignments occasionally arrive from the United States and the Dominions. Thus the re-rollers are now happily placed in regard to material and outputs are at or near the maximum. Export prices of sheets have not been varied, but there has been a cut in home prices consequent on the reduced cost of zinc, and there is a possibility of further reductions.

Rollers of steel sections and plates are concentrating on the completion of their contracts for the current period, but there are many inquiries in circulation for Period III, when possibly some of the chief consumers may be granted increased allocations. In the plate trade, specifications for the thinner gauges preponderate, while brisk business is passing in the normal sizes of sections. Rail mills have all the business they can handle and there are abundant openings in the overseas markets.

Non-ferrous Metals

The downward drift of non-ferrous metal prices has continued; copper has declined to 16 cents per lb. in New York and zinc to 9 cents. No change is reported in lead at 12 cents, but there are reports that some selling took place below that figure, and it will be surprising if 12 cents proves to be the bottom for this metal. Nevertheless, there has now been something like four months of falling values and the market is certainly fully due for a "technical" recovery. This may well occur before long, but it does not follow that another setback will not be seen. On the contrary, the position is such that lack of confidence will almost certainly bring about another "standstill" in buying by the consumers and this, in time, will halt the recovery and encourage another drop. Curtailment of copper production has certainly begun, and will continue, for there is a fashion in this as in other actions by the trade. A section of the Chilean copper field is to cut by 30 per cent., causing a monthly reduction of between 7,000 and 8,000 tons. Other interests may well follow suit, and this in itself is likely to bring about something of a check to the rapid decline now in progress. On the other hand, it is almost certain that in some directions at any rate buyers will feel that the situation must be very bad if the large producers are compelled to slash their output in this drastic fashion.

Interest in the tin situation is growing and there is a feeling that before very long there will be a change in the value of this metal. Consumption, at any rate outside the United States, appears to be falling and, even allowing for the influence exerted by stockpile buying, it certainly seems doubtful whether the quotation can be maintained at £569 per ton. Meetings of the Study Group have been taking place, and the market is waiting to learn whether a new scheme is to be arranged. Judging from such information as has been made available, it would appear that consumers will be expected to take certain fixed tonnages, or rather the consuming countries will be on a quota, which they should take up without fail. This "hard and fast" kind of arrangement has been much in favour since the war, but it is doubtful if the economy of this country will stand much more of these rigid arrangements. More than anything else a flexible system is required, and the sooner this can be effected the better.

Minister Warns Tin Study Group

Opening the fourth meeting of the International Tin Study Group in London on June 14, Mr. G. R. Strauss, Minister of Supply, declared that it was of the utmost importance that recovery of the producing countries should not be jeopardised by "unregulated and uncoordinated action." The process of recovery in the countries of South-Eastern Asia, he said, had been slow, and it was only now that the tin-producing industry was getting back to something approaching its pre-war position. It had sustained more direct physical damage during the war than any other of the great primary industries of the world. "Your recommendations," Mr. Strauss told the Group, "may exert a momentous influence on the future of any industry upon which some of the producing countries depend in a very large degree for their economic and social health."

The meeting elected Mr. W. G. Fergusson (United Kingdom) as chairman.

Recent Wills

RABONE, W. T., of Phillips & Rabone, Limited, brassfounders, of Birmingham £28,475

COLPITTS, J. W., founder and principal of J. W. Colpitts & Company, Limited, marine engineers, of Blyth £4,647

TAYLOR, A. J., joint managing director of Taylor Bros. (Sandiacre), Limited, railway engineers and ironfounders, of Nottingham £8,964

TREVORROW, J. H. L., a director, and late deputy chairman and managing director, of the Chesterfield Tube Company, Limited, and a director of Tube Investments, Limited £13,972

MONYPENNY, J. H. G., originator of the research department of Brown Bayley's Steel Works, Limited, Sheffield, who wrote the first book on stainless steel to be published in this country; a past-chairman of the British Chemical Plant Manufacturers' Association and a Fellow of the Institute of Physics £2,171